DECEMBER 1956

ROADS and STREETS

HIGHWAYS • BRIDGES • AIR FIELDS • HEAVY CONSTRUCTION

Gillette Publishing Co., 22 West Maple St. Chicago 10, Illinois

A GILLETTE PUBLICATION

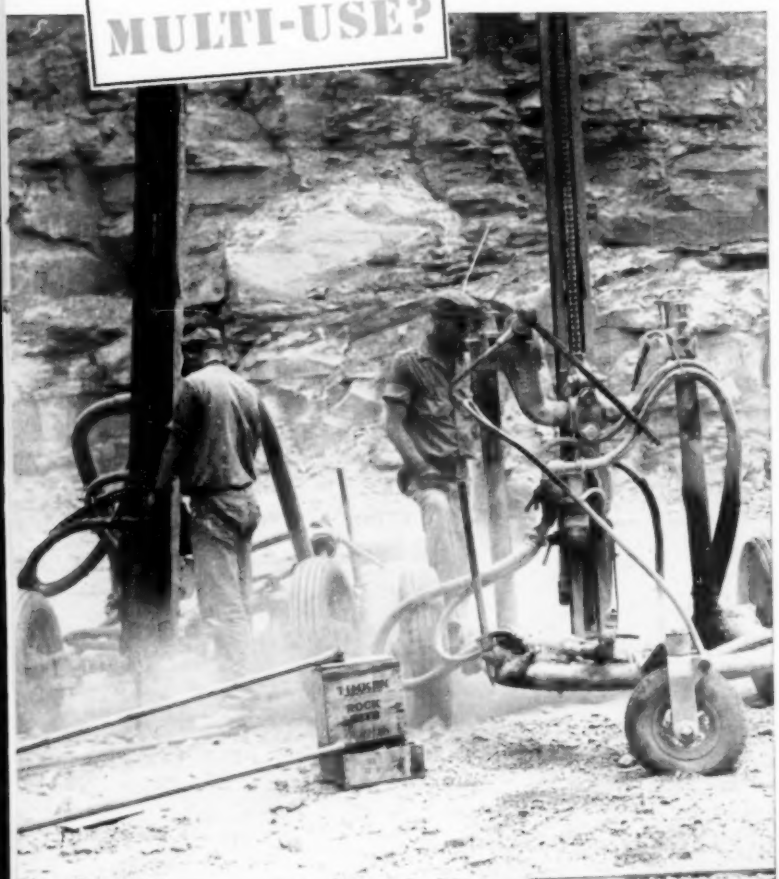
Accepted as Controlled Circulation Publication at Milwaukee, Wis.

UNIVERSITY MICROFILMS R6
EUGENE B.POWER
313 N.1ST ST.
ANN ARBOR,MICH.
COMP-LRV-11-50

CARBIDE INSERT? or MULTI-USE?

"Bit cost so low with TIMKEN® multi-use rock bits it's hardly an item"

. . . says Acme Construction Co.



LOCATION: By-Pass State and Federal Project, U. S. Route #52, Welch, West Virginia.

OPERATING CONDITIONS: Soft shale to very hard sandstone.

FOR precision drilling in mountain-side formations from soft shale to very hard sandstone, Acme Construction Co. of Beckley, W. Va., used only one size of Timken® multi-use bits. With controlled distribution of reconditioned bits, Acme got a bit cost so low they barely consider it an item.

Driller after driller gets similar savings. With correct and controlled reconditioning, Timken multi-use bits give the lowest cost per foot of hole when full increments of steel can be used in ordinary ground.

But they may not be the best answer for *all* your drilling problems.

When you drill in hard, abrasive ground, you get higher speeds and greater economy by switching to Timken carbide insert bits. They're your best bit for extremely deep holes, constant-gauge holes, small diameter blast holes.

Timken multi-use and carbide insert bits are important time-savers when your drillers change bits. They're interchangeable in the same thread series. And dozens of different Timken bits fit the same drill steel. Bits can be changed right on the job.

All Timken bits are made from Timken fine alloy steel and have special shoulder unions to protect the threads from drilling impacts. We're the only removable rock bit manufacturer that makes its own steel. We do it to control quality at every step of the way. To find out which bit will save the most and do the best job for you, call on Timken Rock Bit Engineering Service. Write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Timken threaded multi-use rock bit

Timken threaded carbide insert rock bit

your best bet for the best bit . . . for every job

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

. . . for more details circle 258, page 16

260% Greater Torque...

when your equipment is powered with Chrysler Industrial Engine and Chrysler Torque Converter

Here's a "natural" for any product requiring dependable power *plus* the means of automatically increasing *work ability* throughout the engine's speed range.

It's the Chrysler "power twins"—Chrysler Industrial Engine and Chrysler Industrial Torque Converter. Together, they make a lightweight, compact package offering high torque multiplication—up to 260% greater torque than you may be getting now—plus easy installation and trouble-free operation. Torque Converter features include dual cooling (liquid and direct air), and an optional built-into-housing output shaft governor control.

Chrysler Industrial Torque Converter is assembled with the Chrysler Industrial Engine of the manufacturer's choice. The combination may be ordered Chrysler-equipped for use with direct drive, transmission or power takeoff. Manufacturers may also specify high or low inertia flywheel—whichever best meets their requirements.

Check this power combination—Chrysler Industrial Engine (230 to 331 cubic inch displacement, in-line 6 or V-8), plus Chrysler Industrial Torque Converter. For more details see a Chrysler Industrial Engine Dealer, or write: ***Dept. 105, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.***

BUILT FOR EACH OTHER—CHRYSLER INDUSTRIAL ENGINE AND CHRYSLER INDUSTRIAL TORQUE CONVERTER

HORSEPOWER WITH A PEDIGREE

INDUSTRIAL ENGINE DIVISION
CHRYSLER CORPORATION

Chrysler INDUSTRIAL ENGINES

. . . for more details circle 190, page 16

Under an Army Engineers contract, Southern Roadbuilders, Inc., Augusta, Ga., is general contractor for this section of work at MacDill Air Base.

15-in. Concrete at MacDill Air Base Laid with Bethlehem Dowel Units

Expansion of facilities at MacDill Air Force Base in Florida included the laying of a new runway extension 500 ft wide by 1420 ft long and a connecting taxiway 1420 ft by 75 ft. Shown above is the pouring for a parking apron 980 ft by 1250 ft.

Because these new facilities must serve the heaviest planes in use today and take the punishment of jet take-offs, concrete was laid generally 15 in. deep. And Bethlehem Dowel Units were used in all dowelled transverse joints.

Bethlehem Dowel Units were chosen for the heavy-duty concreting at MacDill Air Force Base for a number of reasons. Bethlehem Dowels extend across the paving joint and are so installed that they transfer the loads of heavy planes from one side of the joint to the other while offering no substantial restraint to the movement of the slab in its own plane. The unit holds the dowels in accurate alignment at all times, both horizontally and vertically, and permits their free movement in the concrete.

The Bethlehem Dowel Unit reaches the job site completely fabricated, ready for installation. Two men can easily handle the unit, with no delay to pouring time.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

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ROADS AND STREETS

Sixty-Four Years of Editorial Leadership

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Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 63 years of continuous publishing in the highway field; combined with Engineering and Contracting and Good Roads Magazines, established in 1892.

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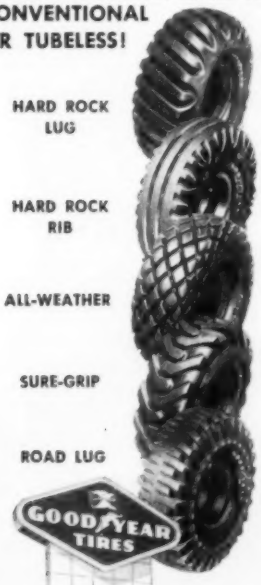
14.8 MILLION YARDS TO MOVE, 56 BRIDGES TO BUILD,

IN 29.6 MILE DALLAS-FORT WORTH "SIX-CHUTER"!

Unlike most other turnpikes, the 6-lane Lone Star Speedway is being cut, filled, borrowed and spanned along a populated route, crisscrossed by many heavily travelled roads. To add to contractors' headaches, up to 300,000 gallons of water a day have to be trucked in for compacting. Note how self-propelled scrapers are *tandemed* to tackle the sun-hardened soil. Tires are Goodyear's wide-base Hard Rock Lugs—now standard on much original equipment.

Tire maintenance in field helps construction men beat tight work schedule.

OTHER 3-T NYLON CORD TIRES—CONVENTIONAL OR TUBELESS!



Look for this nearby Goodyear dealer sign for better tire values—better tire care.

. . . for more details circle 213, page 16

End tube and flap troubles FOREVER!

Specify Goodyear 3-T NYLON CORD *TUBELESS TIRES* on new equipment of every size!

Goodyear tubeless tires and rims are now *standard* on foremost original equipment—or supplied on specification.

In them, you get the regular Goodyear cost-cutting features PLUS many *new* savings of time, trouble and tire-cost-per-yard, possible only with Goodyear TUBELESS.

TO MENTION JUST A FEW: No tube or flap troubles—no tube replacements—easier mounting and dismounting—airtight assembly—cooler running—slow leaks instead of blowouts—easier repairs—simpler, re-usable valve-parts.

Get all the facts from your helpful Goodyear dealer. Goodyear, Truck Tire Dept., Akron 16, Ohio.

Buy and Specify **GOODYEAR**

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Road Lug, Sure-Grip, All-Weather—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Why TDA® is the World's Largest Manufacturer of Driving Axles for Medium and Heavy Duty Commercial Vehicles

In its many years of service to American industry, Timken-Detroit® has produced more than 6,300,000 driving assemblies for powered vehicles (industrial, agricultural or automotive). The "Ten Automotive Firsts" on the opposite page are but a few of the significant results of TDA research and development.

these 10 Automotive Firsts have established TDA® leadership

in producing over

5,000,000

Driving Axles for America's Trucks and Busses

plus 1,300,000 for other powered units!

1. Tandem Driving Axles—TDA developed the first tandem driving axles for the industry to increase the capacity of vehicles.

2. The Double-Reduction Axle (both single and two-speed types)—TDA developed the first double-reduction axles, principally to permit higher axle shaft torque values for nominal pinion input torques.

3. The 3-for-1 Axle—TDA introduced the principle of interchangeability of three optional drives in the same housing . . . single-reduction . . . single-speed double-reduction . . . and two-speed double-reduction.

4. Heavy-Duty Hypoid Gearing—This successful TDA innovation made possible larger, stronger, longer-wearing pinions of greater torque capacity for the same tooth load at the pitch line than corresponding spiral bevel pinions.

5. The Power-Shifted Two-Speed Axle—TDA's power-shift made the two-speed axle universally acceptable. It simplified driver operation, providing improved vehicle control and safety.

6. Unit Mounted "P" Series Power Brake—This highly efficient, compact, easily maintained air brake with lightweight fabricated steel shoes has all parts "unit mounted" on a spider.

7. Tapered Brake Linings—TDA "Econo-Liner" tapered brake linings, first to offer maximum thickness in the area of greatest wear which resulted in uniform thickness when worn.

8. First 100,000 Mile Guaranteed Axle Shaft—Torsion flow forging, controlled gradient hardness heat treating and shrouded spline design make the TDA shaft the best in the industry; first to be guaranteed for 100,000 miles.

9. The Tubular Trailer Axle—TDA adapted the tubular form to trailer axles to make a lighter, stronger axle than any previously available.

10. The "Wide Range" Two-Speed Axle—TDA was the first to develop two-speed axles with ratios of 2 to 1 and 2½ to 1 between the upper and lower ranges, to overcome the basic limitations of mechanical and automatic transmissions.

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TIMKEN Detroit AXLES

TIMKEN-DETROIT AXLE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
DETROIT 32, MICHIGAN

The Accepted T D A Standard
TRADE MARK REGISTERED

Plants at: Detroit, Michigan
Oshkosh, Wisconsin • Utica, New York
Ashtabula, Kenton and Newark, Ohio
New Castle, Pennsylvania.

WORLD'S LARGEST MANUFACTURER OF AXLES FOR TRUCKS, BUSSES AND TRAILERS

HOW TEXACO LUBRICATION

helped build world's largest earthfill and concrete dam

By helping to keep a vast array of earth moving and other equipment on the job and running dependably, Texaco Lubricants and Lubrication Engineering Service played an important part in the construction of Folsom Dam, Folsom, California.

Equipment maintenance men there were particularly pleased with Texaco performance. For example—

TEXACO MARFAK—for its ability to protect chassis parts against wear and rust and to stay on the job in spite of heavy loads, jolts, dust and mud.

TEXACO MARFAK HEAVY DUTY—for its ability to seal dirt and moisture out of wheel bearings, to give longer lasting protection with no seasonal change required.

TEXACO ROCK DRILL LUBRICANT EP—for its ability to lubricate effectively and prevent rust whether drills are running or idle.

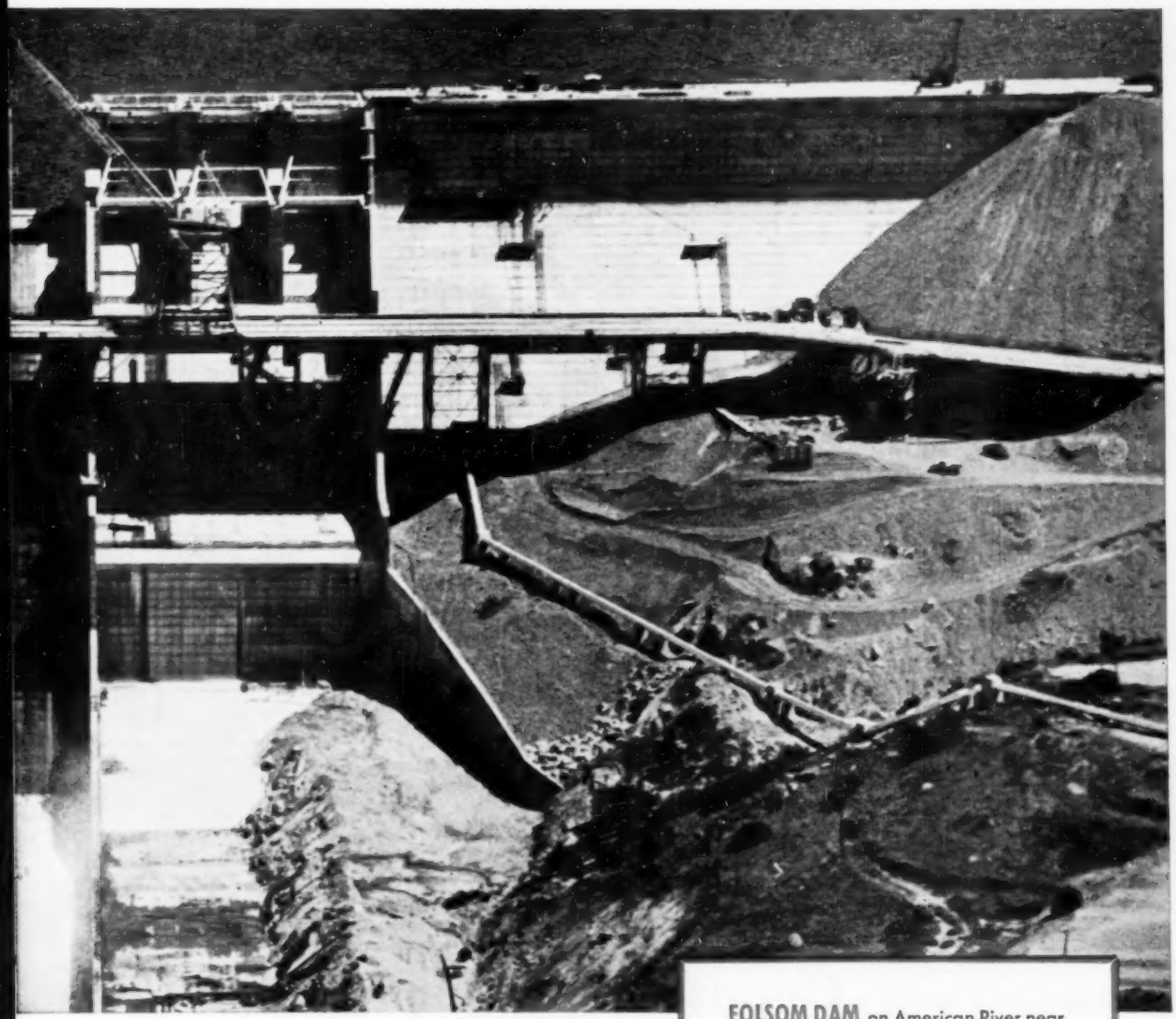
TEXACO TRACK ROLL LUBRICANT — for the long-lasting protection it gives rollers even under severest conditions.

The foregoing are just four of the six basic Texaco Lubricants used in the Texaco Simplified Lubrication Plan to handle *all* major lubrication. Texaco

TEXACO

TEXACO

TRADE MARK REGISTERED



U. S. Army, Corps of Engineers photo

FOLSOM DAM on American River near Folsom, California. Merritt-Chapman & Scott Corporation and The Savin Construction Corporation, contractors for main dam *(shown)*, credit Texaco Lubricants and Lubrication Engineering Service with a big assist in keeping construction equipment working dependably and maintenance costs low.

Lubrication Engineering Service will gladly develop a specific Plan to meet your requirements and help you simplify and improve your maintenance lubrication.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

. . . for more details circle 255, page 16

Hydrocrane Cleans Up the Bottleneck Jobs on Street Repair and Highway Construction

A fast-traveling, smooth-working Bucyrus-Erie Hydrocrane can turn in top profits while handling dozens of digging, lifting, moving, materials handling and clean-up assignments on street repair and highway construction jobs. Equipped with clamshell, it digs manholes, hydrant pits, water, sewer, gas line trench. It loads trucks, handles special digging jobs around bridges and overpasses. Put on a crane hook and you can pull sheeting, handle concrete forms, shoring, timber, as well as lift parts for hooking up other equipment.

With smooth, proved hydraulic power, the Hydrocrane has precision control that ordinary equipment can't match. Telescoping boom permits moving equipment and supplies in and out of close quarters, over and under obstructions without moving the crane an inch. Sturdy outriggers set or retract at the touch of a lever . . . let you set up or get away fast. Highway speeds of up to 50 mph let you get to emergency spots in a hurry—clean up a job—move right on to another trouble spot.

Find out all the ways a Hydrocrane can speed your road-building work. Ask your Bucyrus-Erie distributor about the 5-ton, ⅜-yd. H-3 and (pictured above) the new 10-ton, ½-yd. H-5. 156H56

BUCYRUS ERIE

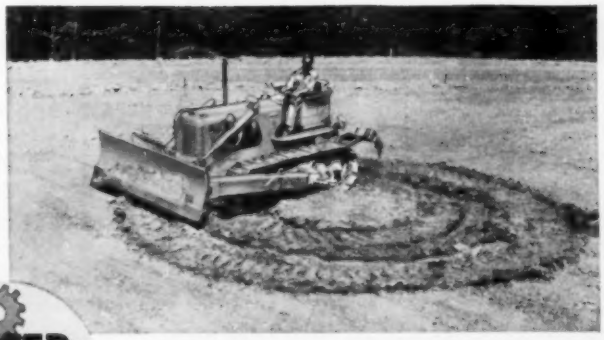
SOUTH MILWAUKEE, WISCONSIN

. . . for more details circle 272, page 16

New POWER-TURN Steering

gives you tighter turns with two-track power

Look at that turn! That's what a tight turn looks like with *full power on both tracks.* It means 100% working power at all times, even on the sharpest turns. It means added work capacity. It's POWER-TURN steering—another exclusive Oliver development.



POWER-TURN

OLIVER OC-12

...More push for your profits, too!

With 53 drawbar h.p., the OC-12 is one of the most powerful tractors of its class. Now POWER-TURN makes it pay still bigger dividends. You sweep through turns of *any* radius with full load. Or hold a straight line in angle dozing with the heaviest off-center loads.

Yet POWER-TURN is actually simpler. Two interconnected systems of control provide planetary reduction gears on each track. Here is the maximum in efficient flow of power, 100% tractive turns, better maneuvering. Operation is easier, too, with finger-tip controls to take all the muscle out of it.

In addition to POWER-TURN, the new OC-12 offers new over-center hand clutch and foot brake for greater operator convenience. Why not sit at the controls yourself and see the difference? Your Oliver distributor will gladly demonstrate. Call him today.

THE OLIVER CORPORATION

400 West Madison Street, Chicago 6, Illinois

. . . for more details circle 281, page 16

OLIVER

A COMPLETE LINE OF INDUSTRIAL WHEEL AND CRAWLER TRACTORS AND MATCHED ALLIED EQUIPMENT

How many yards per hour?

PAYLOADER® "more yardage" features

Balanced four-wheel-drive, torque-converter and exclusive power-transfer differentials give more effective traction on mud, gravel, ice and snow for more reliable crowding power. Coupled with this crowding power is the unusual pry-out action and 40° tip-back of the bucket at ground level to get full bucket loads with less spillage loss. The result is that a "PAYLOADER" can

dig more

The 40° tip-back of the bucket at ground level permits a carry position that is close and low for maximum stability and with bucket opening almost level to prevent spillage of heaped loads. Hydraulic system shock absorber cushions the loaded bucket while carrying, smooths the ride and allows higher carrying speeds with less spillage. These features enable a "PAYLOADER" to

carry more

It's the yards delivered that count on any job and that's where a "PAYLOADER" really pays off. It gets more load in the bucket with less spillage to begin with — it can carry at higher speeds with less spillage — it can maneuver faster because the power-shift transmission requires no stopping for ANY shift. All these advantages enable "PAYLOADER" tractor-shovels to

deliver more

More yards on any job!

No one knows better than you that a rubber tired tractor-shovel can do so many jobs, under so many kinds of job conditions, that the yardage handled can vary considerably. That's why yardage figures can be so misleading unless all the factors are taken into consideration . . . kind of material . . . whether in-place or rehandling . . . operator efficiency . . . length of haul . . . waiting time for trucks . . . one location or scattered jobs, and many other variables that affect daily output.

But of this you can be certain . . . on any given job the new "PAYLOADER" tractor-shovels will deliver more yards per day than any comparable size tractor-shovel . . . and will do so continuously shift after shift.

The knowledge and experience gained in building thousands of tractor-shovels over the past 30 years is your assurance that a "PAYLOADER" is superior in design, engineering and performance . . . that it will outperform and outproduce any other comparable unit on any job.

So don't be deceived by "box-car" yardage figures . . . take a close look at the "PAYLOADER" . . . on *your* job . . . and you be the judge. Your "PAYLOADER" distributor will be happy to arrange a demonstration at your convenience.

THE FRANK G. HOUGH CO.
768 Sunnyside Ave., Libertyville, Ill.

Send data on 4-wheel-drive "PAYLOADER" tractor-shovels as checked

- ☐ HO (2¼ yd. payload, 1¾ yd. struck)
- ☐ HH (1¾ yd. payload, 1-1/3 yd. struck)
- ☐ HU (1-1/3 yd. payload, 1 yd. struck)

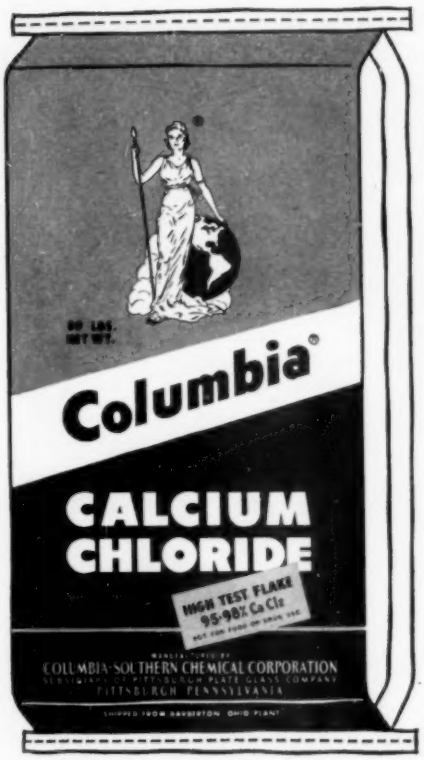
Name_____
Title_____
Company_____
Street_____
City_____
State_____ 7

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

Announcing...

High Test Flake

COLUMBIA CALCIUM CHLORIDE



Now ready for your Winter Ice Control Program

Columbia HIGH TEST FLAKE Calcium Chloride which tests 95-98% $CaCl_2$ is now being shipped from the Barberton, Ohio, plant.

This new HIGH TEST FLAKE production is in addition to Columbia's regular flake.

Columbia HIGH TEST FLAKE Calcium Chloride has approximately 20% higher calcium chloride content than regular flake. An 80 pound bag of HIGH TEST FLAKE does the job of 100 pounds of regular flake. This higher concentration results in (1) smaller tonnages for you to handle, and (2) freight savings due to the higher calcium chloride content by weight.

Now, for the first time, Columbia-Southern offers $CaCl_2$ users a convenient, easy to handle 80 pound bag.

Contact your Columbia supplier or your nearest district sales office for prompt delivery on your HIGH TEST or REGULAR FLAKE calcium chloride requirements.

Use Columbia Calcium Chloride for efficient, economical Winter Ice Control

Columbia Calcium Chloride applied to abrasive stockpiles makes them freezeproof, allows for easy spreading. The abrasives thus treated immediately imbed themselves in icy surfaces for sure skidproofing protection. Abrasives are less apt to blow away, and one truckload of treated abrasives goes as far as 3 truckloads of untreated.

Columbia Calcium Chloride applied directly to ice melts it quickly and permits it to be easily bladed off the road.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland • Boston New York • St. Louis • Minneapolis • New Orleans • Dallas • Houston Pittsburgh • Philadelphia • San Francisco

IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

. . . for more details circle 195, page 16

LORAIN 26

BIG POWER CLUTCHES RESULTS

A BIG, HEAVY-DUTY 3/4-YD. SHOVEL-CRANE

Here is a powerful and extra-husky 3/4-yd. shovel-crane that can take the constant punishment of hard, *heavy-duty* service. The Lorain-26 is big, heavy and sturdy. It has lots of power, plenty of clutch capacity and a long and wide crawler, providing excellent stability in the toughest digging. Also available as 15 or 17½-ton crane. Ask your Thew-Lorain Distributor to add more facts to the features listed below—you'll see why the Lorain-26 is the machine to buy for those extra-tough jobs.

TURNTABLE FEATURES—*"E-Z" controls—all linkage mounted on anti-friction bearings • "Hydra-Ease," power, crawler controls • New, bigger 18" shoe clutches—for fewer adjustments and longer life • Big, heavy-duty, truss-reinforced, rigid turntable bed • "No-shock, no-stall" hydraulic coupling available.*

CRAWLER FEATURES—*Wide, long, heavy crawlers • 2 travel speeds in both directions • Wide, 29" drop-forged treads • Sealed idler rollers on anti-friction bearings available • Independent travel available, ideal for hoe and dragline service.*

BOOM FEATURES—*3 hoe dippers—30" to 40" • Longer, stronger 19-ft. shovel and 19-ft. hoe booms • Full manganese shovel dipper for heavy-duty digging • Independent cable crowd on shovel • Usable as shovel, crane, clamshell, dragline or hoe.*

. . . for more details circle 256, page 16

The Lorain-26 Hoe digs deeper in harder materials, has excellent stability to give greater digging ranges. All-welded, box-section, rugged boom is "goosenecked" for deep digging.

THE THEW SHOVEL CO., LORAIN, OHIO

THEW LORAIN

WHAT'S NEW in Equipment and Materials

Coating Prevents Material Sticking to Equipment

A new coating product, claimed to solve the problem of sticking materials, has been introduced by The Thomas Co., 1645 Hennepin Ave., Minneapolis 3, Minn. Marketed under the registered trade mark Powerfilm, the coating, which is sprayed, brushed or wiped on, resists the sticking of concrete, clay, moist dirt, coal, lime, snow and other materials to equipment.

For more information circle 101 on Service Coupon this page and mail now.

Beaded Reflective Signs

Perfectly smooth, low cost, beaded reflectorized signs are now available at low cost as a result of a new process developed by Cataphote Corporation, 954 Wall St., Toledo, O., according to an announcement by C. E. Searight, Executive Vice President.

Cataphote signs reflectorized with the new coating process are reported to permit a saving of 25% in cost. The perfectly smooth surface is stated to make the signs exceptionally dirt-proof and weather resistant. Utilizing ultra high index reflective beads with wide angularity, the new process is claimed to provide more effective reflectorization under adverse weather conditions.

The outcome of three years of research with reflective glass beads, the new exclusive Cataphote reflectorizing process was developed principally for the recently adopted U. S. standard white on red STOP signs. The company claims the process results in a paint-smooth surface that is a bright red by day and unusually brilliant when reflected at night.

White on red STOP signs reflectorized by the new process are available in the standard 24 in. x 24 in. size or the 30 in. x 30 in. size. The company also plans to use the new process for reflectorizing green and white information signs such as used on the new turnpikes and freeways, and other signs where reflectorization is desirable.

For more information circle 102 on Service Coupon this page and mail now.

Concrete Cutting Diamond Blades

Four new concrete cutting diamond blades are now being marketed by the Clipper Manufacturing Co., Suite 749, 2800 Warwick, Kansas City, Mo., two for cutting old concrete and two for sawing green concrete.

The CD-68-3 and CD-78-3 are made in the ⅛-in. width with a 3/16-in. diamond depth for cutting old concrete. The CD-68-3 is stated to be ideally suited for sawing old concrete containing aggregates of medium hardness. The CD-78-3 may be used for sawing old concrete containing favorable aggregates, and should be used on saws with 25 H.P. or more. This blade also gives low cost cutting when used on asphalt, and when used on this material, it is not necessary to saw with a higher horsepower unit.

The CD-69-3 and CD-79-3 are both made in the 9/64-in. width and have a 5/16-in. diamond depth. Both were developed for sawing green concrete. The CD-69-3 will saw control joints in all types of aggregates but is best suited for aggregates of the medium-to-hard groups, such as granite and river gravel. It has been succesfully used in cutting joints in concrete as old as seven days with 25 H.P. saws or larger.

The CD-79-3 is best suited for sawing green concrete with a medium type aggregate such as weathered granite, dolomitic limestone, and slabs containing river gravel with a mixture of limestone.

For more information circle 103 on Service Coupon this page and mail now.

More equipment news page 122

Track-Mounted Wagon Drill

A new self-propelled, one-man operated, track-mounted wagon drill, the G-800 Tracdril, announced by Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y., is stated to give an exceptionally productive performance when mounting a heavy-duty 4-in. drifter. For speedy soft-formation drilling it can mount a CP-556 rotauger.

Two "Power Vane" reversible tramming motors enable the G-800 to tow its own air compressor around the drilling area. Each track is independently powered by one of the two 6 hp. motors. Spring loaded "dead man" type motor controls give instantaneous forward-back or pivot control, yet insure operator safety by returning to neutral when released. During actual drilling operations, the G-800 is uncoupled from the compressor and, within hose limits, moves easily from hole-to-hole. Complicated hose hook-ups are eliminated because the air supply is always close to the operation.

Since the tramming motors are never used while the drifter or rotauger is in use, a 365 c.f.m. rotary compressor will provide full operating efficiency. However, the G-800 has plenty of reserve tractive power and will tow a 13,000-lb. Chicago Pneumatic 900 c.f.m, rotary compressor up a 10% grade.

The Tracdril has a special "knee action" construction to compensate for ground irregularities. Tracks operate independently within the "knee action" limits and keep the U-arm support for the drill carriage relatively level. This U-arm is hydraulically elevated or lowered and employs dual safety locks to hold the setting. The drill carriage itself may be quickly adjusted for high top-hole or toe-hole drilling and further compensates for ground irregularities.

For more information circle 104 on Service Coupon this page and mail now.

MAIL THIS COUPON TODAY!

ROADS & STREETS
22 West Maple Street
Chicago 10, Illinois

CIRCLE THE NUMBERS AND MAIL NOW!

Please send me further information on products and materials mentioned in the December Roads & Streets as circled below

About New Equipment and Literature:

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Name_____ Title_____

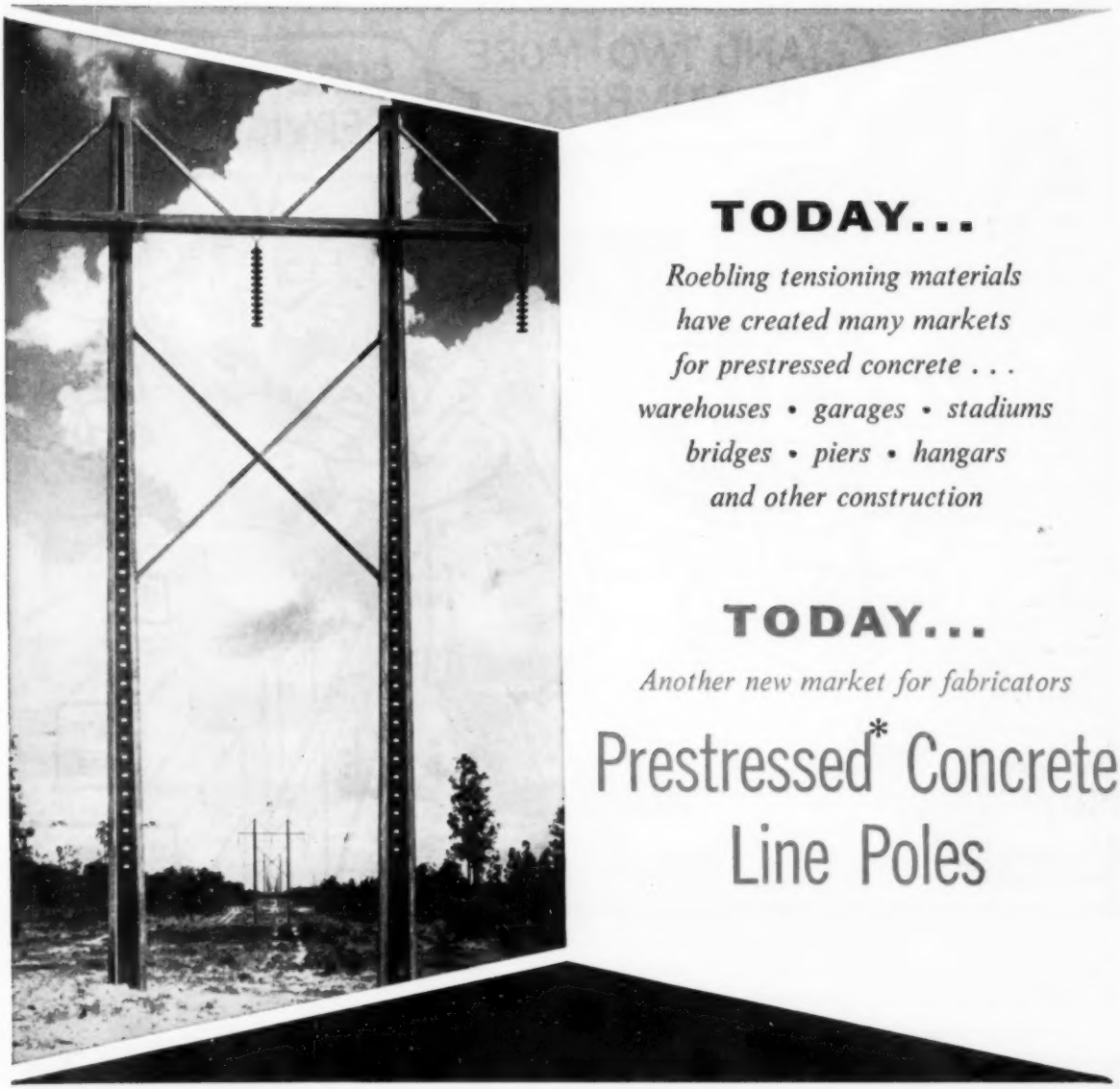
Firm or Gov't. Dept._____

Street_____

City_____ State_____ 12-56

NOT GOOD AFTER JANUARY 15, 1957

A READER SERVICE FOR YOUR NEEDS



TODAY...

Roebling tensioning materials have created many markets for prestressed concrete . . . warehouses • garages • stadiums bridges • piers • hangars and other construction

TODAY...

Another new market for fabricators

Prestressed* Concrete Line Poles

Shown here is one of the latest in the constantly growing list of applications for prestressed concrete. These power line poles were designed and fabricated for the Florida Power Corporation by Finfrock Industries, Inc., Orlando, Florida.

Each pole is prestressed with ⅜" diameter Roebling uncoated 7-wire stress-relieved strands, pretensioned and bonded to the concrete.

Easily transported and installed, the 65 ft (above ground) poles have a life expectancy of 50 to 100 years. Once erected, they are maintenance-free. The high cost of replacement every few years is elimihated.

Why don't you investigate the possibilities of this new market to increase your profits? Roebling engineers, who pioneered in the development of prestressed concrete in America, will supply general information or help with specific problems. Write to Construction Materials Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING CF&I

A Subsidiary of The Colorado Fuel and Iron Corporation

*Not *to be confused with ordinary reinforced concrete*

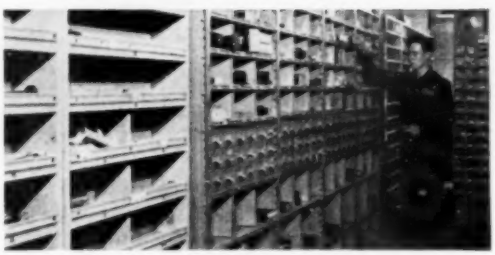
. . . for more details circle 247, page 16

There's a difference in parts quality. And there's a whale of a difference in parts *service*, too.

At your Caterpillar Dealer your order is checked against up-to-the-minute parts catalogs and other *strictly current* references. You're always sure the parts delivered are the *right* parts—they fit and function properly. But while your Caterpillar Dealer naturally excels in emergency service, your needs are mostly routine; and his routine service is quick, accurate and complete, too.

When you need a part, why take a chance? Call on your Caterpillar Dealer. Get CAT* original parts—and SERVICE—every time.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



Your Caterpillar Dealer's parts staff is carefully selected, carefully trained under direct factory supervision. Training is continuous and thorough. The service you get is *expert* service—*Caterpillar service.*

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

. . . for more details circle 188, page 16

ROADS AND STREETS
Sixty-Four Years of Editorial Leadership

Washington News Letter

By Duane L. Cronk

December 10, 1956

The answer to "How much should trucks pay for use of the highways?" may be just around the corner. In Washington last month, a committee of the Highway Research Board revealed progress on a number of studies designed to yield some heretofore unknown facts.

The venture is being pushed in three directions. Among the questions for which statistical answers are being sought are these:

● How much do truckers actually profit by heavier loading? Researchers are analyzing the operating records of truckers in 35 states to discover how much the unit costs of trucking are reduced by shipping in larger loads, and where is the point of diminishing returns.

● What is the demand for highway transportation in terms of weight? Here, the committee is studying actual shipping statistics to find out if there is a trend toward heavier shipping.

● What does it cost to build and maintain highways designed for various truck weights? The $12-million AASHO road test out in Illinois is expected to yield a picture of how trucks of various weights affect pavements of various design. Test traffic is expected to begin next summer and will run for two years. A complex, specially constructed system of electronic devices will measure, record and classify the effect of the traffic on the road. Meanwhile, a test loop to carry passenger cars and pick-up trucks only is being designed.

Congress has asked the Bureau of Public Roads to come up with some sort of formula for allocating the cost of new roads among highway users and the general public. G. P. St. Clair, BPR's financial research chief, reported last month that the study will be a comprehensive project. Every principle element of highway cost - right-of-way, grading, pavement and base, structures and maintenance - will be appraised, to determine how costs vary as a result of two major factors - volume of traffic and vehicle size. The highway study must be completed within 15 months.

* * *

Highway costs are slipping steadily upward. The price level for federal-aid road construction was 3.8% higher during the 3rd quarter of '56 than the preceding quarter, this on the heels of a 2.3% rise in the 2nd quarter. Everything is up - excavation, 1.3%; surfacing, 4.7%; structural reinforcement, 4.8%; structural steel, 4.1%; structural concrete, 4.2%; and composite for structures, 4.4%.

(continued on next page)

Although the trend was somewhat expected, officials are beginning to mentally figure how much the new prices will upset their estimates of what the National Highway Program will cost. The new construction costs are nearly 12% over those of the second quarter of 1955 - just about the time road officials were estimating the highway program would cost Uncle Sam about $37 billion. The inflation trend since then may shoot the cost of the program upward another $5 billion.

Meanwhile, the BPR has begun a second, more careful estimate of what the National System of Interstate and Defense Highways will cost. The $27-billion figure given Congress last year for this System was a "planning" estimate only. Now, the Bureau is asking the state highway departments to give it a truer "engineering" estimate, based on firm location and built-in access control. The Bureau will keep a closer check on the accuracy of reports from the states this time. "We want to be better able to defend this estimate," a top official declared last month.

* * *

Thousands of hotel reservations have poured in for the 1957 ARBA Road Show, "The World's Fair of the Construction Industry," opening in Chicago next month. Scheduled for January 28 to February 2, the big exhibit will be staged at Chicago's huge International Amphitheatre. The 250 manufacturers of construction and maintenance equipment sponsoring the Show report that it will be the largest indoor exposition ever assembled by any American industry.

The Amphithreatre's indoor floor area, equivalent to 12 football fields, will be covered with the newest models in machinery. It has been nearly nine years since the last Road Show. Manufacturers are determined to make the upcoming affair the news event of 1957.

(Available rooms are going fast. Roadbuilders planning to attend should make application to the A.R.B.A. Housing Bureau, c/o Chicago Convention Bureau, 134 North La Salle St., Chicago 2, Ill.)

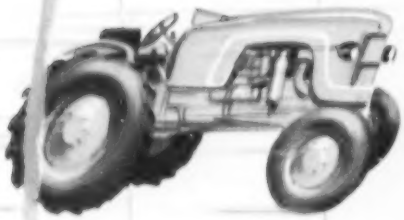
* * *

Cutting "red tape" even further, the new federal highway administrator, John A. Volpe, last month announced that, hereafter, BPR field offices may approve programs of projects proposed by the states for construction on the 520,000-mile Federal-Aid Secondary System. Until now, the Washington office has insisted on approving such plans. Some 39 states have already come under a simplified Secondary Road Plan authorized by Congress in '54, by which the federal government may waive its responsibility for such programs if the state certifies that previously approved standards and procedures will be followed.

* * *

Airport construction is having a good year under a "souped up" federal-aid program. For the first time in the history of the program (it was drafted by Congress 10 years ago), three grants were made in one year. A total of $323 million in federal funds is now programmed for about 3,374 airport projects. And officials here expect to have the 1958 funds programmed by January.

THE INDUSTRIAL TRACTORS THAT SMASH THE PERFORMANCE BARRIER!



POWER LINED WHEELERS

by MM MINNEAPOLIS·MOLINE

SEE THESE NEW OUTWORK ANYTHING

335 INDUSTRIAL WHEELER

Here's new performance and new class in this power and price bracket! Packs 47 b.h.p. with a big 165 cu. in. high-compression engine, offers wide choice of hydraulic pumps for operating front or rear-mounted equipment. Ampli-Torc 12-speed drive, 3-point hitch, and power steering.

NOW . . . 5 GREAT MM INDUSTRIAL TRACTORS — A FULL LINE OF ALLIED

335 INDUSTRIAL WHEELER
Post Driver or Auger Digger cuts placement costs with PTO drive and 3-point mounting. One man runs this cost-cutting rig.

445 INDUSTRIAL WHEELER
Front End Hydraulic Loaders handle bulk material or palletized loads, speed every job. Gasoline or LP gas.

445 UTILITY WHEELER
Rear-mounted Hydro-Blades or Scoops do grading and ditching, take only minutes to mount or dismount. Gasoline or LP gas.

UTIL WHEELER
The standard of industry! UTIL Wheelers offer "shuttle gears" for 6 speeds forward . . . 6 reverse, instant shifting. MM Diesel or Gasoline.

POWERLINED WHEELERS ELSE IN THEIR CLASS

● Last year's job costs go out the window with this Wheeler-Loader-Backhoe at work! New high-turbulence 57 bhp 445 Wheeler with Ampli-Torc *to double* power on-the-go makes a mean dozer . . . a fast-cycling loader. The precision mounted pumps (practically any size you want) give you a maximum speed and a new high in hydraulic efficiency. 445 prices are realistic and it's a money-maker. Ask your MM Dealer. He'll surprise you!

445 INDUSTRIAL WHEELER

Champion in the ¾-cu.-yd. loader class! This 445 Wheeler has a 57 bhp engine and all the POWERlined advantages! The 445's big-capacity hydraulic 3-point hitch handles all standard 3-point equipment and the extra-heavy 3-point tools—offers weight and muscle for toughest jobs.

THESE ARE THE POWERlined ADVANTAGES!

1. Big-displacement, high-compression engines—new from the crankshaft out!
2. Built-in hydraulic power steering is optional on all POWERlined Wheelers!
3. Ampli-Torc 12-speed transmissions (optional) let you double tractive power in any gear at the touch of a lever—without clutching—without shifting—on the go!
4. Hydraulic-controlled 3-point hitch systems designed to handle all standard 3-point equipment!
5. Hydraulic pumps are part of the tractor—in wide range of capacities!
6. Independent rear power-take-off—constant running, constant speed! Front PTO for side-mounted equipment.
7. Full selection of allied 3-point and front-mounted equipment!

EQUIPMENT!

GB WHEELER

MM's most powerful industrial tractor! Offers big capacity with MM's Wheeler mobility. MM Diesel, Gasoline or LP gas.

THE GOLDEN POWER LINE

MINNEAPOLIS-MOLINE

INDUSTRIAL POWER DIVISION

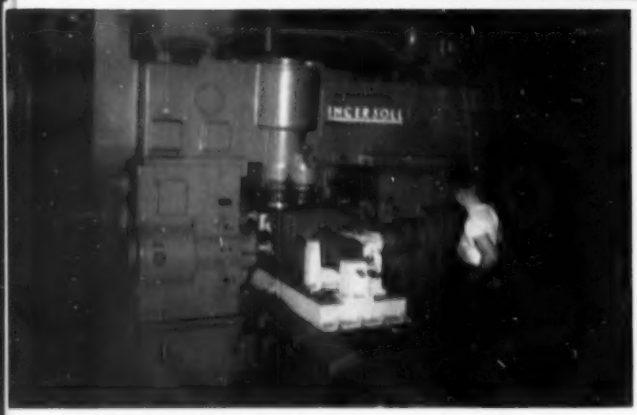
MINNEAPOLIS 1, MINNESOTA

runs this cost-cutting rig.

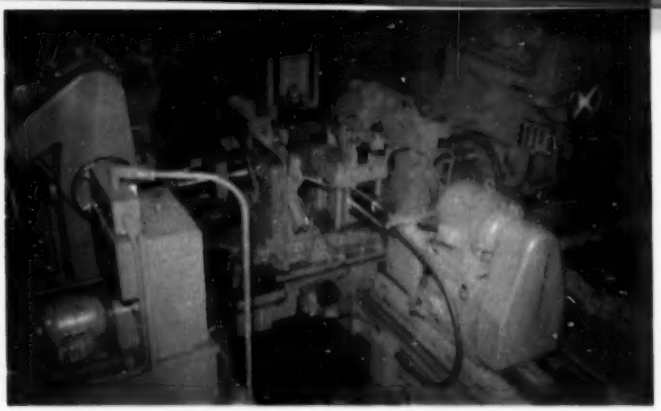
Gasoline or LP gas.

dismount. Gasoline or LP gas.

reverse, instant shifting. MM Diesel or Gasoline.



Top and ends of differential cases are milled in one operation through this automatic machine. Result: New precision tolerances!



Push-button controls allow complete operator control of new production tools through all work cycles.

POWERLINED WHEELERS

NEW AS THE NEWEST TOOLING CAN MAKE THEM!

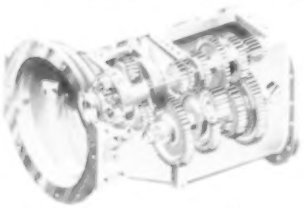
How do we know for certain that these POWERlined Wheelers are the last word in industrial tractor design?

Because we discovered that POWERlined design standards were so high, manufacturing problems so completely different from anything ever before attempted, that only the most advanced tooling and production methods could do the job!

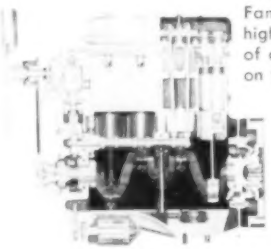
Performance requirements of the POWERlined series of MM Industrial Tractors were set in the hustle-bustle of hundreds of actual job sites, where split-second response and unheard-of power-speed ranges proved a must. To build the tractors that could meet these requirements, Minneapolis-Moline retooled from top to bottom—the biggest retooling project in MM history!

That's why you can expect a *new* step ahead in performance from these POWERlined Wheelers—a new step ahead from a company that has always stood at the top in performance. These are the tractors only MM could design . . . and only modern machinery could build!

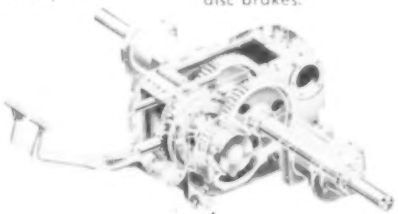
NEW AMPLI-TORC DRIVE!
Change top power to top travel speed in every gear without shifting, without clutching—on the go!



NEW ENGINES!
Famed MM high-turbulence, high-torque power with a host of advantages for longer life on tough industrial jobs.



NEW FINAL DRIVE!
One-piece bull gears, forged-steel differential gears, single-unit final drive and rear axle housing, heavy-duty double-disc brakes.



See you at the ROAD SHOW, CHICAGO, Jan 28—Feb. 2, 1957

MINNEAPOLIS-MOLINE MINNEAPOLIS 1, MINNESOTA

Send me complete performance data and specifications on the new POWERlined series of MM Wheelers. I am especially interested in the following tractors:

335 INDUSTRIAL WHEELER 445 INDUSTRIAL WHEELER
445 UTILITY WHEELER

Also include complete information on the following:
UTIL WHEELER GB WHEELER

Name _____ Title _____

Firm or Department _____

Address _____

City _____ State _____

I am a dealer interested in an MM franchise. I understand some top-rated territories are open and would like to get more facts.

Yes . . . I want the down-to-earth facts . . . all of 'em—on NEW POWERlined WHEELERS by **MM**

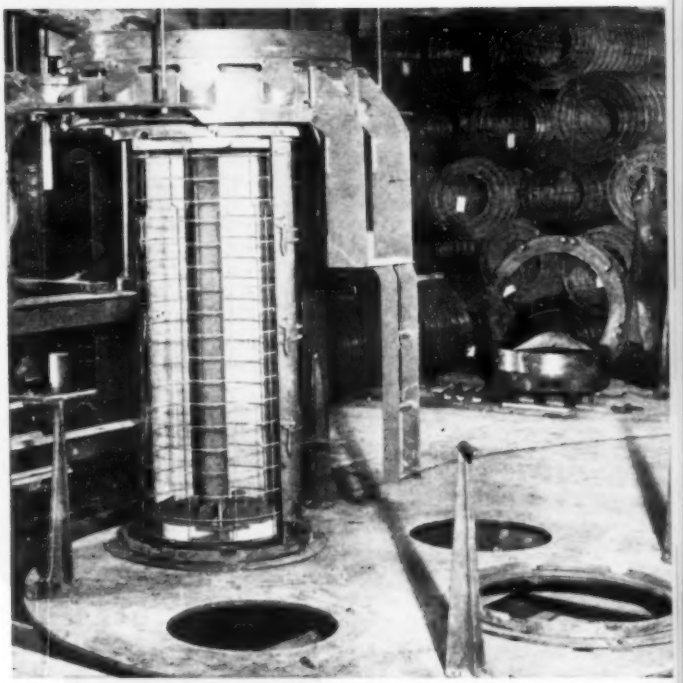
Printed in U.S.A.

Diesel, Gasoline or LP gas.

INDUSTRIAL POWER DIVISION
MINNEAPOLIS 1, MINNESOTA

concrete pipes, like highways, last longer when reinforced . . . with

CLINTON WELDED WIRE FABRIC . . .



Welded Wire Reinforcement in concrete pipe means strength to withstand internal pressure and concentrated external loads . . . minimizes deterioration and controls cracking. With Clinton Welded Wire Fabric, every joint is securely welded to assure firm anchorage and provide a bond of steel and concrete that makes pipe tough and durable.

Clinton Welded Wire Fabric conforms to all A.S.T.M. specifications and is available in a complete range of gauges and mesh sizes. So whenever you need concrete pipe—it will pay you to specify pipe that's reinforced with Clinton Welded Wire Fabric.

WHEN THEY ASK "is it Reinforced"
SAY YES . . . WITH

CLINTON
WELDED WIRE FABRIC
THE COLORADO FUEL AND IRON CORPORATION

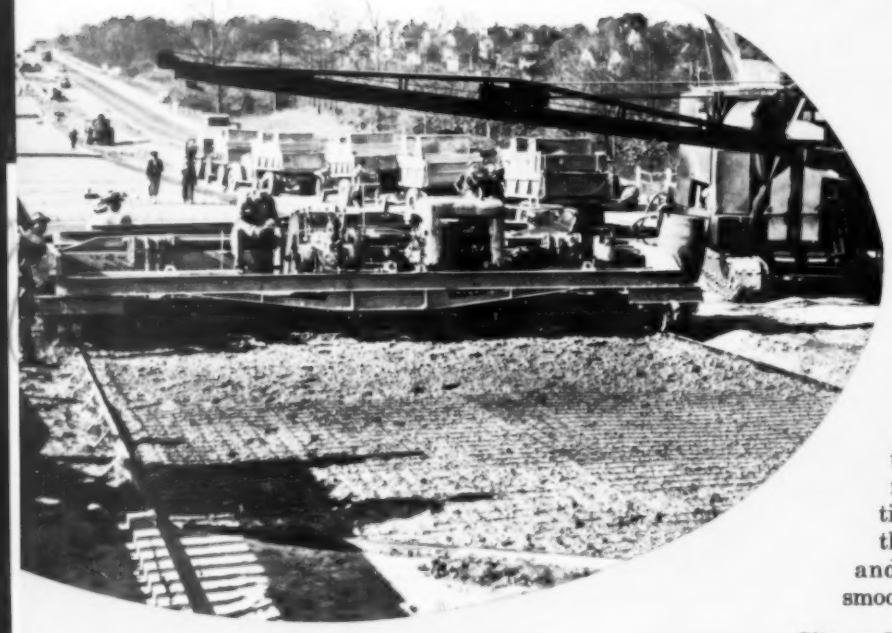
CF&I

4435

THE COLORADO FUEL AND IRON CORPORATION - Albuquerque • Amarillo • Billings • Boise • Butte • Casper • Denver • El Paso • Ft. Worth • Houston
Kansas City • Lincoln (Neb.) • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • Seattle • Spokane • Wichita
WICKWIRE SPENCER STEEL DIVISION - Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia
CF&I OFFICES IN CANADA: Toronto • Montreal CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

highways last longer when reinforced . . .

with CLINTON WELDED WIRE FABRIC



Clinton Welded Wire Fabric is unmatched as the backbone of well designed highways. Embedded in concrete or asphaltic concrete, Clinton Welded Wire Fabric imparts the positive mechanical anchorage needed to obtain even load distribution, control cracking, and minimize the deteriorating effect of temperature and moisture variations . . . assures smooth and long-lasting highways.

Clinton Welded Wire Fabric is available in a wide variety of gauges and spacings for all reinforcing requirements. It meets all A.S.T.M. and A.A.S.H.O. specifications.

WHEN THEY ASK "*is it Reinforced*"
SAY YES . . . WITH

CLINTON WELDED WIRE FABRIC
THE COLORADO FUEL AND IRON CORPORATION • DENVER • OAKLAND • NEW YORK

CF&I

Meetings

HIGHWAY RESEARCH BOARD — Annual Meeting, Sheraton-Park Hotel, Washington, D.C.; January 7 to 11, 1957.

ASSOCIATED EQUIPMENT DISTRIBUTORS — 38th Annual Meeting, Conrad Hilton Hotel, Chicago, Ill.; Jan. 27-30, 1957.

AMERICAN ROAD BUILDERS' ASSOCIATION — Road Show and 55th Annual Convention, Amphitheatre, Chicago, Ill.; Jan. 28-Feb. 2, 1957.

NATIONAL BITUMINOUS CONCRETE ASSOCIATION, Inc. Annual Convention, Conrad Hilton Hotel, Chicago, Illinois; January 31 – February 2, 1957.

AMERICAN CONGRESS ON SURVEYING AND MAPPING. 17th annual meeting, Shoreham Hotel, Washington, D. C., March 3-9, 1957. (American Society of Photogrammetry, 23rd annual meeting to be held in conjunction with the above meeting.)

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC. — Annual Meeting, Statler Hotel, Washington, D.C.; March 11-14, 1957.

Chicago still has rooms

Fifty-seven leading Chicago hotels are cooperating to provide rooms for visitors to the Road Show.

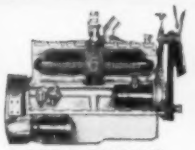
"There are still rooms available, but they are going fast," reports Tom Callaway, assistant to the vice president of Goodyear Rubber Company and Road Show Housing Committee chairman. He urges interested delegates to make reservations at once for the January 2 event, to be staged at Chicago's huge International Amphitheatre. Interested parties should request forms from ARBA Housing Bureau, c/o Chicago Convention Bureau, 134 North La Salle Street, Chicago 2, Ill.

Color Photo Cover Scenes for Roads and Streets

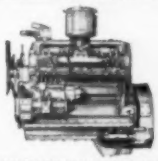
Beginning in January, Roads and Streets will blossom out with full color Ektachrome photographs on its front cover, describing equipment operations and projects deemed of interest to readers.

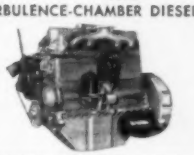
Watch for this issue which will also preview equipment to be exhibited at the Road Show in Chicago, and will contain a special staff report on the role of the highway contractor in the nation's booming road program.

This is HERCULES MOTORS Today


L-HEAD GASOLINE

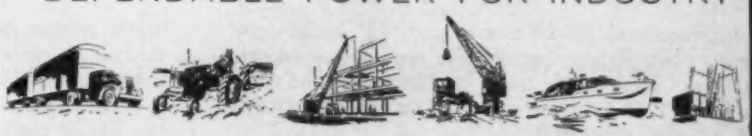
OVERHEAD-VALVE GASOLINE


TURBULENCE-CHAMBER DIESEL


DIRECT-INJECTION DIESEL

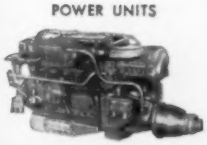
TURBOCHARGED DIESEL

DEPENDABLE POWER FOR INDUSTRY


TRANSPORTATION AGRICULTURE CONSTRUCTION INDUSTRIAL MARINE OILFIELD

L.P.G. OR NATURAL GAS

POWER UNITS


MARINE DIESELS

Yes, this is Hercules Motors, today—all types of dependable power for modern industry. The Hercules line includes more than 90 different models of engines and complete power units ranging from 3 to 500 H.P.

An ever-growing list of customers are solving their power problems with these types of Hercules Engines: L-head gasoline, overhead-valve gasoline, natural gas, L.P.G., turbulence-chamber diesels, direct-injection diesels, Turbo-Charged Diesels, marine diesels and complete open, closed and base type power units.

Write for more information on any of these dependable power plants. Our sales-engineers will be happy to help solve your power problems. No obligations, of course.

HERCULES MOTORS CORP.

Engine Specialists Since 1915 • Canton, Ohio

. . . for more details circle 216, page 16

TURNPIKE TESTS PROVE:

"75" PAYSCRAPER®

CARRIES

12% more...

DELIVERS IT

15% faster

• • • • •

TD-24 push

An International TD-24 tractor and "75" Payscraper recently out-pushed, out-loaded, and out-sped all equal-sized competitive units in accurate on-the-turnpike tests. This data was obtained on the Illinois toll road job near Rockford.

All tests were conducted under similar conditions on the same cut, in the same material, and under the supervision of the contractor's grade foreman. Loading time was limited to exactly one minute. Scraper loads were weighed on special new accurate scales. Haul length was held to 2,000 feet for all scrapers.

Final figures amazed all observers! Results showed first, that *the "75" Payscraper carried 12% more dirt per load...delivered it 15% faster than the other two scrapers tested;* second, that *the TD-24 torque converter pusher heaped an average of 1.2 cu yd extra into all scrapers tested.* (See charts, at right.) A competing manufacturer substantiated these same figures!

Here's conclusive proof that no matter what scraper the TD-24 pushes, you load more in any given time... and that the "75" Payscraper carries more, no matter what pushes it! And that the TD-24 and "75" Payscraper, teamed together, out-produce other equipment combinations with faster loading, bigger loads, and all-around faster cycles.

Prove the stand-out pushing, loading, and cycle-speeding performance of the International TD-24 tractor and "75" Payscraper on your own jobs. Ask your International Construction Equipment Distributor for a demonstration!

Load-Speeding Action. High horsepower-to-weight ratio and speeds up to 24 mph—plus operating ease of air-assisted clutch; big, safe, 4-wheel air brakes; exclusive Hydro-Steer—all help the Payscraper gain time, increase earth-moving capacity!

Clipboard in Hand, equipment engineer signals "75" to begin controlled one-minute push-loading from TD-24 torque converter tractor. Although TD-24 push-packed an average 1.2 cu yd more in all scrapers, it loaded 2.1 cu yd more in "75" Payscraper, than competing pusher!

...loads 1.2 extra yds. into all scrapers!

PAYLOAD TESTS (average)

Pusher	International "75" Payscraper	Scraper "A"	Scraper "B"
International TD-24 Torque Converter tractor	20.6 cu. yd.	18.2 cu. yd. "75" bonus 2.4 cu. yd.	17.5 cu. yd. "75" bonus 3.1 cu. yd.
Pusher "A"	18.5 cu. yd.	17.0 cu. yd. "75" bonus 1.5 cu. yd.	17.1 cu. yd. "75" bonus 1.4 cu. yd.

CYCLE TIME TESTS (average)

International "75" Payscraper	4.8 min.
Scraper "A"	5.7 min.
Scraper "B"	5.6 min.

"75" Payscraper Proves 15% faster ... delivers up to 19 extra loads per 10-hour day

See you at the ROAD SHOW—CHICAGO Jan. 28-Feb. 2, 1957

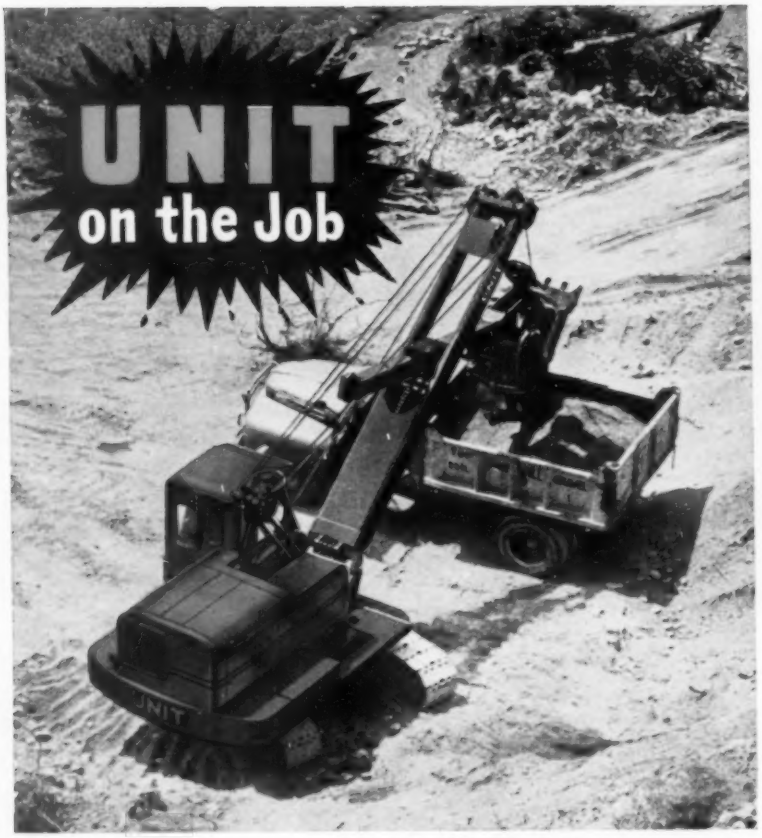
INTERNATIONAL HARVESTER

INTERNATIONAL® Construction Equipment

International Harvester Company, 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Boom Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Trucks . . . Diesel and Carbureted Engines . . . Motor Trucks

For more details circle 220, page 16



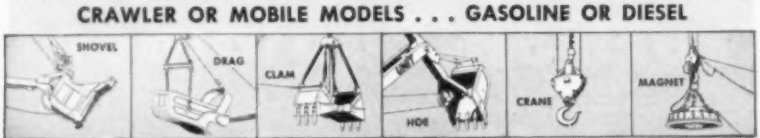
SWING SPEED makes PAY LOADS!

Here's a UNIT ½ Yard Shovel doing a PRODUCTION DIGGING JOB in a gravel pit. UNIT owners like the ease of operation and the FULL VISION CAB for complete visibility. They also like the sturdy construction and the many mechanical features, plus the ECONOMICAL PERFORMANCE and LOW UP-KEEP which all add up to EARNING POWER. Why not investigate what UNIT can do for you — on YOUR next excavating and material handling job?

SEE FOR YOURSELF: *Let us send you our novel TV Brochure. It illustrates the complete UNIT line.*

UNIT CRANE & SHOVEL CORPORATION
6407 WEST BURNHAM STREET • MILWAUKEE 14, WISCONSIN, U. S. A.

½ or ¾ YARD EXCAVATORS...CRANES UP TO 20 TONS CAPACITY
CRAWLER OR MOBILE MODELS . . . GASOLINE OR DIESEL

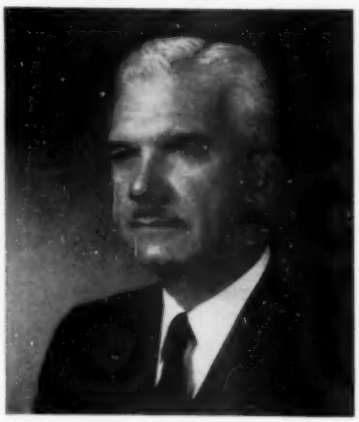


All Models Convertible to ALL Attachments!

. . . for more details circle 260, page 16

Headlines

Tallamy, new administrator



● Bertram D. Tallamy, new federal highway administrator appointee who expects to take office in January, following formal approval by Congress. Mr. Tallamy has been chairman of the New York State Thruway Authority and was for a time superintendent, New York State Department of Public Works.

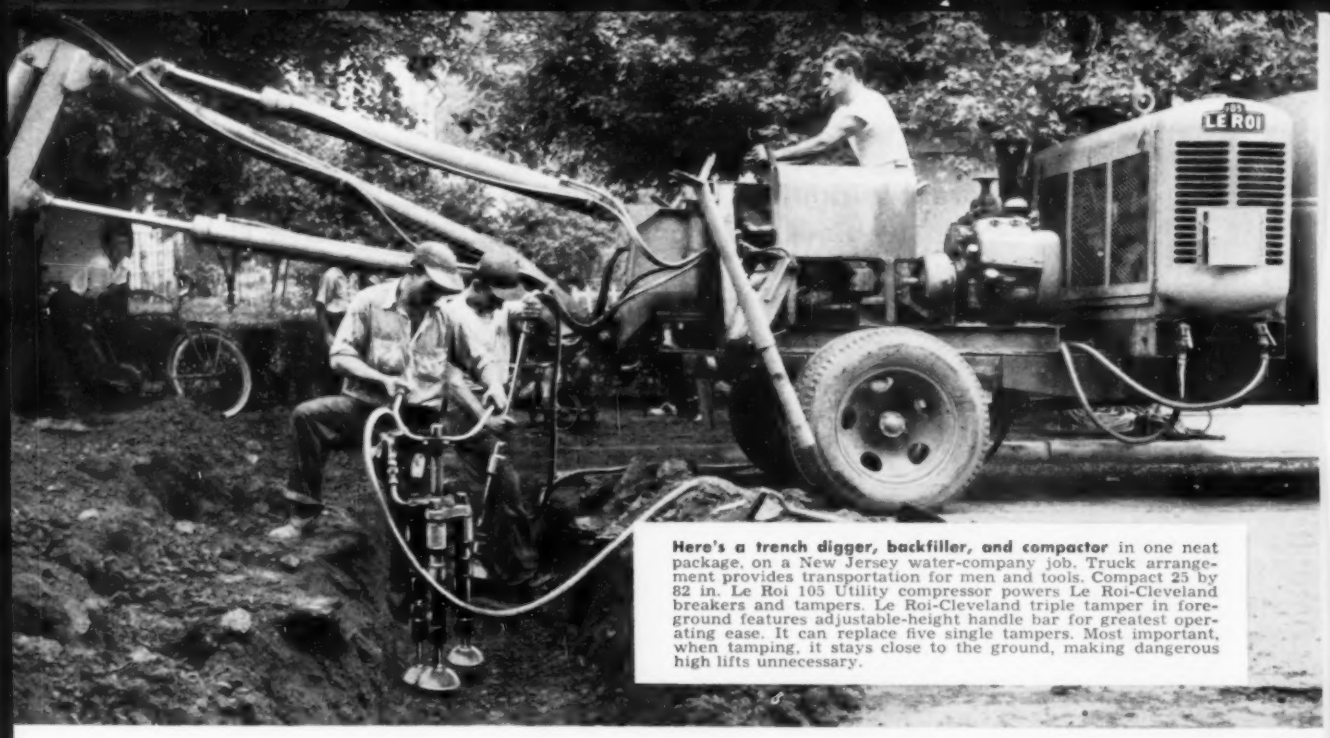
New highway safety effort planned in N. Y. state

Highway department executives and municipal officials are watching with interest the move initiated by Governor Harriman in New York State. He has urged a revamping of the state's Bureau of Motor Vehicles to tighten the present license suspension system and step up enforcement procedures. This is part of a broad new highway safety program for the state.

The recommendations include provisions for closer cooperation with adjoining states, particularly Connecticut where accident prevention methods have been notably successful.

The Connecticut experience, according to Richard I. Kahl, former research director for New York's joint legislative committee on motor vehicle problems, suggests the need for a strong independent motor vehicle administration before any hopes of designing and maintaining low-accident highways can be realized. The motor vehicle licensing is recommended to be separated from the burden of the political patronage appointee problems.

(Continued on page 32)



Here's a trench digger, backfiller, and compactor in one neat package, on a New Jersey water-company job. Truck arrangement provides transportation for men and tools. Compact 25 by 82 in. Le Roi 105 Utility compressor powers Le Roi-Cleveland breakers and tampers. Le Roi-Cleveland triple tamper in foreground features adjustable-height handle bar for greatest operating ease. It can replace five single tampers. Most important, when tamping, it stays close to the ground, making dangerous high lifts unnecessary.

Work-Saving Air-Tool Applications

by LE ROI

Highway construction in Mexico is frequently for the birds, or literally could be as this picture indicates. Two operators pictured on this treacherous perch rely on easy-handling Le Roi-Cleveland sinkers, as do 38 others on job. To complicate the fatigue problem, this area around Chilpancingo is often subject to extreme heat. Sealed dust-proof feature is one reason why these tools produce the powerful, constant rotation needed for fast drilling.

On this $1,600,000 Cleveland sewer job, Le Roi-Cleveland clay diggers set a daily 20-ft. pace. The C-10 clay spade was chosen because a great deal of handling and lifting were required. Operators appreciated a well-balanced tool for this rush job. The spade also is free from bumps, so that operators can get a firm grip and still work close to tunnel walls.

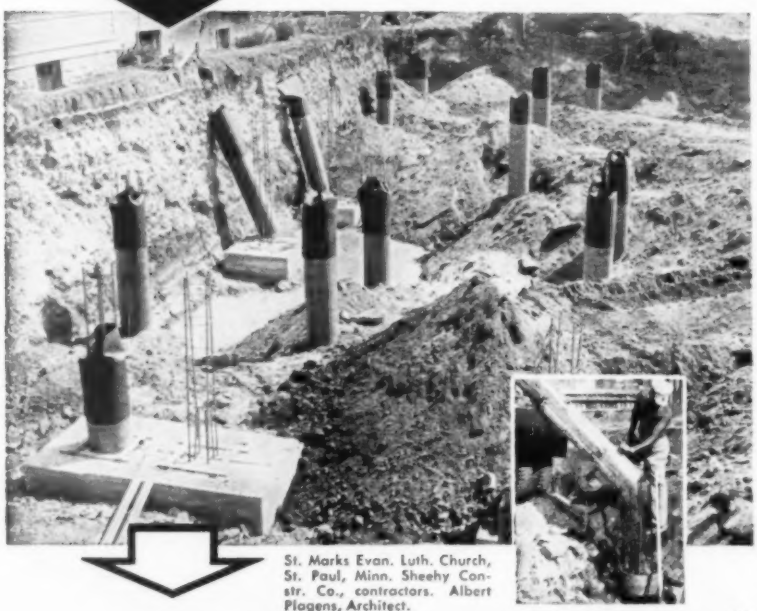
Gas company employee breaks through tough 12-in. concrete. To speed emergency repair work, this utility chose the maximum shattering impact of a Le Roi-Cleveland 52 paving breaker. Work speed, however, was only one consideration. Low-cost operation was important too. The 52's piston air-cushion reduces internal part wear, makes handling easier.

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

RD-51

SONOTUBES®

permit backfilling before pouring and save time and money!



St. Marks Evan. Luth. Church, St. Paul, Minn. Sheehy Constr. Co., contractors. Albert Plagens, Architect.

SONOTUBE®

FIBRE FORMS

for round columns of concrete

In the construction of this church in St. Paul, Minn., the footings for the supporting round columns of reinforced concrete were set well below grade. The use of low-cost SONOTUBES for column formwork made backfilling possible before pouring because stripping and recovery of forms was unnecessary. The SONOTUBES required no bracing as the backfill held them in place. Ready-mix trucks were able to move over the backfill to pour the columns, eliminating the necessity of hoisting the concrete to make the pour. The backfilling, before pouring, resulted in the use of less equipment, labor and material and stepped up construction time.

Low cost SONOTUBE Fibre Forms are approved by architects and engineers and widely used by contractors everywhere.

For a fast, economical method of forming round columns of concrete for underpinning, pile encasement, supporting columns for a variety of structures—use SONOTUBE Fibre Forms.

Available in sizes from 2" to 48" I.D., up to 50' long. Order in specified lengths or saw to your requirements on the job.

Use Sonoco's patented "A-Coated" SONOTUBES for finished columns. Wax-coated also available.

For full technical information and prices, write

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SONOCO PRODUCTS COMPANY

CONSTRUCTION PRODUCTS DIVISION

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MONTCLAIR, N. J. 14 SOUTH PARK STREET

AKRON, IND. • LONGVIEW, TEXAS • BRANTFORD, ONT. • MEXICO, D. F.

. . . for more details circle 251, page 16

Headlines

Safety Effort Planned

(Continued from page 30)

Further recommendations for New York State:

1. Tough measures to assure suspension of driver licenses after two speeding convictions instead of the present three.
2. Increased police enforcement and us of radar extensively in speed zones.
3. Setting of realistic and reasonable speed limits throughout the state.
4. A top level coordinating and directing commission for the state's traffic safety program.

Aluminum sign trusses for Detroit expressways

A new development in highway directional aids—all-aluminum overhead sign trusses—will appear on the Ford and Lodge Expressways in Detroit, early in 1957.

The lightweight structures, completely spanning the superhighways at 74 points, are the first to offer maintenance-free support for large overhead signs visible from great distances. The trusses were designed by Michigan state highway department engineers, in cooperation with Michigan state university and Aluminum Company of America.

Along recognized advantage of the large overhead sign is its high visibility to fast-moving traffic. A previous deterrent to its use was the need for a large supporting structure involving hazard and expense to install and maintain. Aluminum provides a strong lightweight support, easy to erect and rust free. Signs up to 40 ft. in width and 7'4" in length will be supported by the truss spans, which will withstand 100 mph winds.

The truss provides a natural catwalk for electricians who must replace bulbs or otherwise service lights which will illuminate the signs.

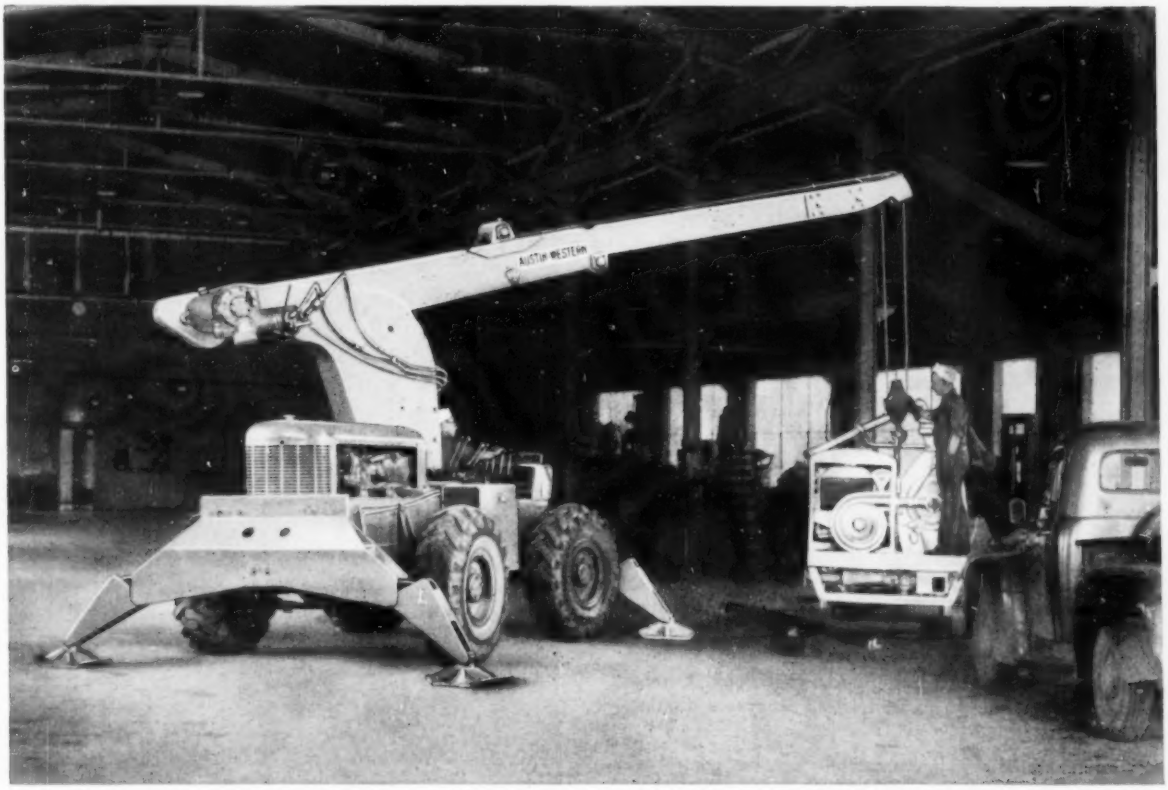
Four welded horizontal tubes and tube diagonal bracing make up the trusses, which will be from 50 to 100 ft. in length. Vertical tubes, two at each end of the truss, with tubular diagonal bracing will provide support. Bridges, 60 ft. or less, will be supported by 7-in. aluminum tubing, while those 65 to 100 ft. will be supported by 8-in. aluminum tubing.

Average weight of the trusses will approximate 3,300 lb. Bases will be fabricated from welded aluminum plate or aluminum sand castings.

(See page 36)

AUSTIN-WESTERN HYDRAULIC CRANE

a great Contractor Tool says John G. Yerington



"Our hydraulic crane is a service unit which, therefore, should be available at all hours, to lower the downtime on more expensive equipment and save the time of our own and our copartners' gangs of men on a job."

"One of the commoner services our hydraulic crane is called upon to perform is changing wheels and heavy tires on other equipment. The 16.00x20 tire on a grader carrying 1½ barrels of water for weight used to be changed by 3 or 4 men by main force and ignorance. Now with the hydraulic crane 2 men make the change in a fraction of the time."

"We maintain 4 storage yards, and since they are not served by overhead cranes, our hydraulic unit is especially valuable there."

"In handling the Benton Harbor airport contract, we laid ¾ of a mile of 24" corrugated metal and reinforced concrete pipe with great success. Our Austin-Western hydraulic unit is so accurate that we can lower pipe ¼" or ⅛" at a time for better and faster pipe fitting. It is easy to handle mixed concrete to the second or third story of a building."

"Our Austin-Western hydraulic crane has the mobility that enables it to go practically anywhere and be of service in dozens of different ways. Its large 14.00x20 tires and their good grip on the ground make it possible to go through sand or wet or loose soil where many other kinds of equipment would have trouble. Four hydraulic stabilizers allow a wide boom swing."

For the complete Yerington story, ask for Gould Certified Report No. 5605.

BALDWIN · BLH · LIMA-HAMILTON

AUSTIN-WESTERN WORKS
BALDWIN-LIMA-HAMILTON
Construction Equipment Division
OTHER DIVISIONS: Eddystone • Lima • Electronics & Instrumentation • Hamilton • Loewy-Hydropress • Standard Steel Works • Madsen • Pelton
AURORA, ILLINOIS, U.S.A.

. . . for more details circle 182, page 16

AUSTIN-WESTERN WORKS
639 Farnsworth Avenue, Aurora, Illinois
Please send complete Gould Certified Report No. 5605.
Name .....
Title .....
Company .....
Street .....
City ..... Zone ..... State .....

Digs up to 25 FEET per minute

Notice the accurate grade you get with this Parsons 150 wheel-type Trenchliner

For pipeline, drainage, irrigation and utility trenching, Parsons 150 Trenchliner brings you big work capacity and precision grading accuracy. It digs from 12 inches to 25 lineal feet of trench per minute. 30 digging feeds assure maximum trench production at every depth, width, and in all soil conditions. Cutting widths range from 16 to 26 inches. Maximum digging depth is 5¾ feet.

Hydraulic wheel-hoist gives smooth, positive control of trench depth. A hydraulic ram on vertical mast raises and lowers the digging wheel — maintains close grade tolerance, an important advantage on any trenching job. A separate hydraulic ram tilts the mast — balances weight of wheel forward on the machine when traveling, loading or unloading on trailer.

For digging dry or wet materials, quick-change buckets on the Parsons 150 Trenchliner are available with gumbo lips, or self-sharpening reversible "Tap-In" teeth. Shiftable, reversible belt conveyor gives controlled discharge, places spoil bank on either side of trench. Tile-laying box and chute (optional) save time and labor on drainage jobs. To suit varying job conditions, this 150 Trenchliner is also available with 16-inch, lug-type crawlers, or 12-inch crawlers with street shoes. Your Parsons distributor has more information that will interest you. See him soon, or write for bulletin.

. . . . Send to: **PARSONS CO.**, Newton, Iowa . . . .

for bulletin on 150 wheel-type Trenchliner

NAME_____

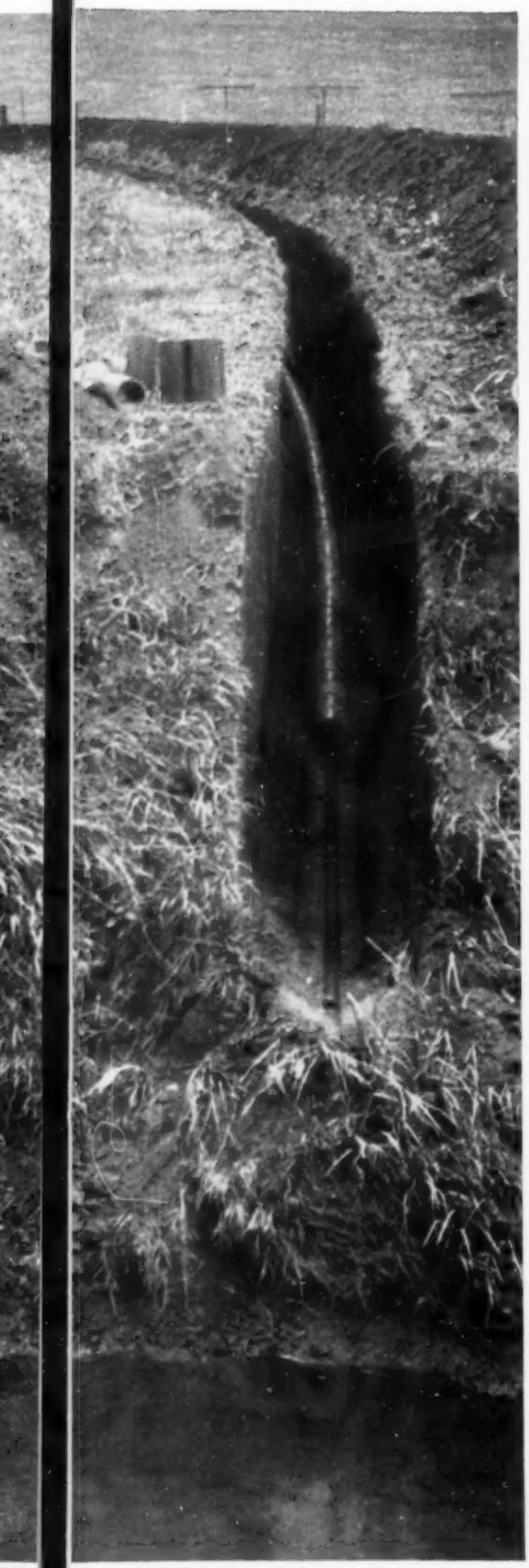
COMPANY_____

STREET_____

CITY, STATE_____

RS

(Koehring Subsidiary) **PARSONS TRENCHLINERS®**



OTHER SIZES of Parsons Trenchliners include wheel and ladder types, crawler-mounted, and utility-size rubber-tired Trenchmobile.®

Bearings packed only once a year on this 4-PM mixer

For more work-time, less maintenance, check this Kwik-Mix 4-PM plaster-mortar mixer. There is no daily lubrication required on the antifriction paddle-shaft bearings. They are packed in grease, multiple sealed. You'll also like the simple de-clutching arrangement on V-belt drive, 4 self-cleaning blades, optional rubber tips. Has 38-inch charging height, 29-inch width, all-welded frame. Kwik-Mix 6-PM, 9-PM sizes also available.

KWIK-MIX • Port Washington, Wis.
(Koehring Subsidiary)

Portable batch plant or cement transfer plant

Johnson Elevating Charger unloads cement from box cars or hopper-bottom cars, and loads into trucks. Charger has a 1000-lb. cement weigh batcher, hung under a 33-bbl. overhead storage hopper. Or, to charge dual-batch trucks, two 1000-lb. batchers can be used. It's easily changed to cement transfer plant by removing batchers, cone, and bolting a 50-bbl. extension section to the upper hopper. See your Johnson distributor.

C. S. JOHNSON • Champaign, Ill.
(Koehring Subsidiary)

20 feet deep with Koehring ¾-yd. 305

On hoe applications, Koehring 305 digs 20 feet below grade, and up to 40 inches wide over side-cutters. ¾-yard dipper pulls up close to the boom, avoids spillage. There's better than 12½-foot clearance at beginning of dump for loading into trucks. It's a versatile, big-capacity machine — readily converts to ¾-yd. shovel, ¾-yd. to 1-yd. clamshell or dragline, and 15-ton crane on crawlers. Truck-mounted 305 has 25-ton lift capacity.

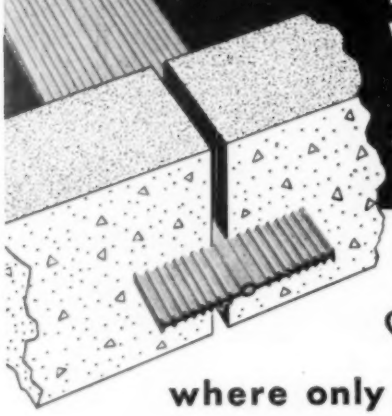
KOEHRING Company
Milwaukee 16, Wis. A61

. . . for more details circle 224, page 16

DURAJOINT®

Polyvinylchloride = PVC

WATERSTOPS FOR EXPANSION & CONSTRUCTION JOINTS



Specified

where only the BEST will do!

Architects and engineers the world over are convinced that "DURAJOINT" is a waterstop on which they can successfully stake their reputation. This thermo-plastic waterstop, designed from a specially compounded Polyvinylchloride = PVC, is extruded with a center hollow bulb and longitudinal ribs on both sides that insure the distribution of critical pressures and enhance the holding power. "DURAJOINT'S" adequate elasticity and excellent tear resistance allows it to successfully handle vertical or lateral movements of masses of concrete without being sheared. Specify "DURAJOINT" with the comfort of knowing that this is a waterstop that will, undoubtedly, outlast the usefulness of the structure in which it is used.

ADVANTAGES

- **Resistant to extreme waterhead pressures**
- **Tensile strength of not less than 1900 lbs. per square inch**
- **Superior holding strength... elongation ability of more than 350%**
- **Effective temperature range of −54°F. to +176°F.**
- **Chemically inert... resistant to acids, alkalis, weather, chlorinated water, oil, fungus, etc.**
- **Quickly, easily spliced "on the job" by merely applying heat and holding the ends together... requires no welding or vulcanizing equipment**
- **Available in lightweight, easy to handle 50 ft. coils... withstands abuse without damage**

"DURAJOINT" enjoys national distribution through the outlets of Tecon Products Inc. in the 11 western states and W. R. Meadows, Inc. in the other 37 states of the mid-western, southern and eastern portions of the United States. Write today for complete information.

A PRODUCT OF ELECTROVERT

Distributed in your area by . . .

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304 S. ALASKAN WAY
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W. R. MEADOWS, INC.
28 KIMBALL STREET
ELGIN, ILLINOIS

. . . for more details circle 269, page 16

Headlines

School time for many state highway employees

As the indoor season starts, many state highway departments and a growing number of counties and cities are swinging into action on training classes of various kinds for employees, as part of an effort to wrestle with the expanding technology of the highway field.

An example is the intensive and well-organized training program in the Colorado department of highways, under personnel director John F. DeVivier and training officer Al Skyrud.

The program this year includes 11 intra-department classes, taught by either employees or outside experts. Each class is held to about a dozen members so that each student may receive concentrated individual attention. Some of the subjects being covered:

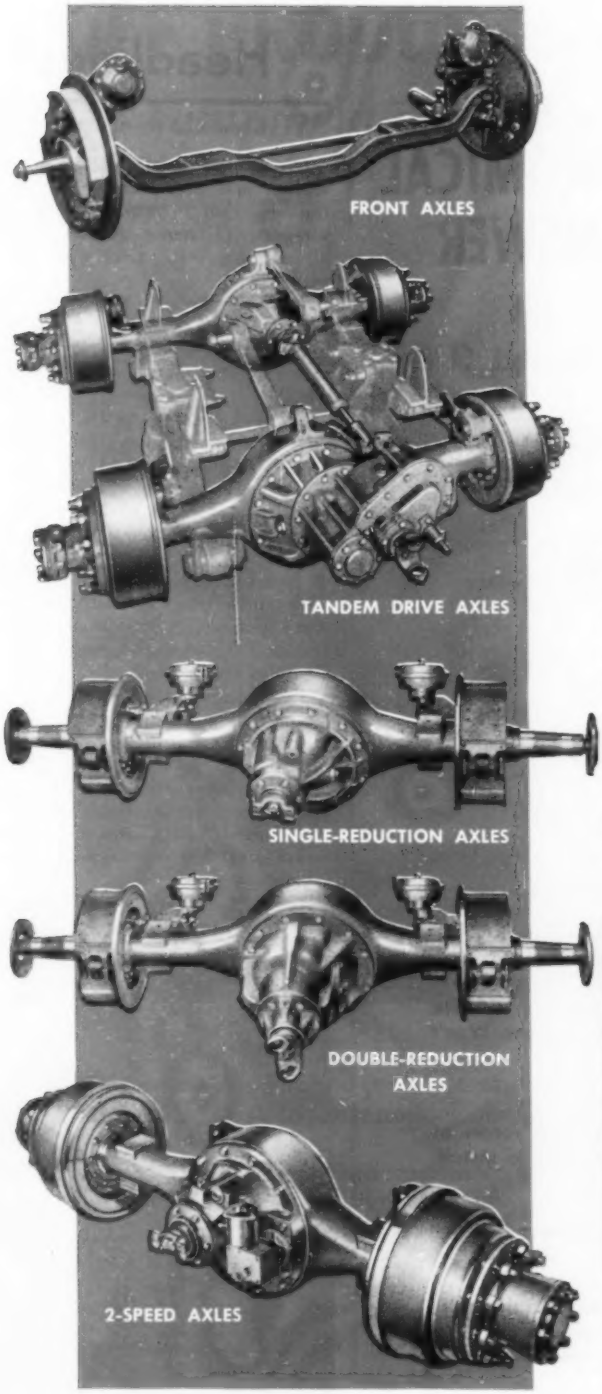
- Writing and Supervising. Two new classes held in late afternoon are covering subjects such as "Effective Business Writing" and "Good Supervisory Practices". Taught by a high-school English teacher, it is a sequel to the course given last spring on "Effective Memos and Letters".
- Mathematics and Design. Includes personnel from the Road Design Section at headquarters and one of the district offices, with a district engineer as instructor.
- Seminar for Mechanics. This annual short course for shop foremen and mechanics includes instruction from manufacturing company representatives.

Earthmoving school planned for international operators

Anticipating a shortage of experienced construction equipment operators in the new U.S. highway program, Greer Technical Institute, 2230 S. Michigan Ave., has opened an earthmoving school in Braidwood, Ill. Keith M. Hutchison is manager of the school's heavy equipment division.

Located on a 600-acre tract south of Joliet, the school will teach men to operate a complete line of earthmoving and motor truck equipment manufactured by International Harvester Company's Construction Equipment and Motor Truck Divisions. Greer selected Harvester's full line of equipment because of Harvester's nearby manufacturing and service facilities.

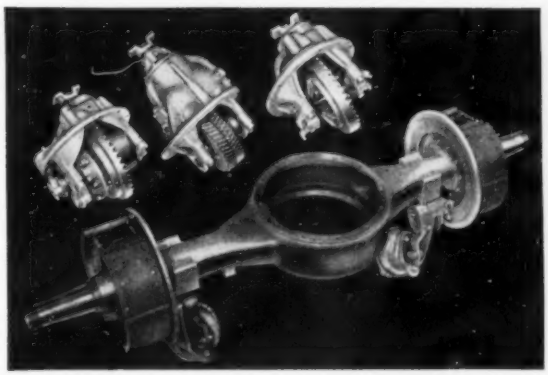
(Continued on page 38)



EATON AXLES

Outstanding Performance Cuts Hauling Costs, Assures Longer Vehicle Life

Strict adherence to exacting quality standards, the most modern of production procedures, and important design advancements developed through Eaton's years of axle experience, combine to offer the truck operator axles with many worthwhile benefits. Eaton Axles, engineered for rugged stamina, keep trucks on the job, hold down operating and maintenance costs, and deliver more vehicle miles at lower cost per mile.



This rugged housing, used in famous Eaton 2-Speeds, is also used for Eaton single-reduction and double-reduction axles. The three types of heads are interchangeable.

EATON — *AXLE DIVISION* — MANUFACTURING COMPANY
CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

. . . for more details circle 200, page 16

the key to lasting keyed joints . . .

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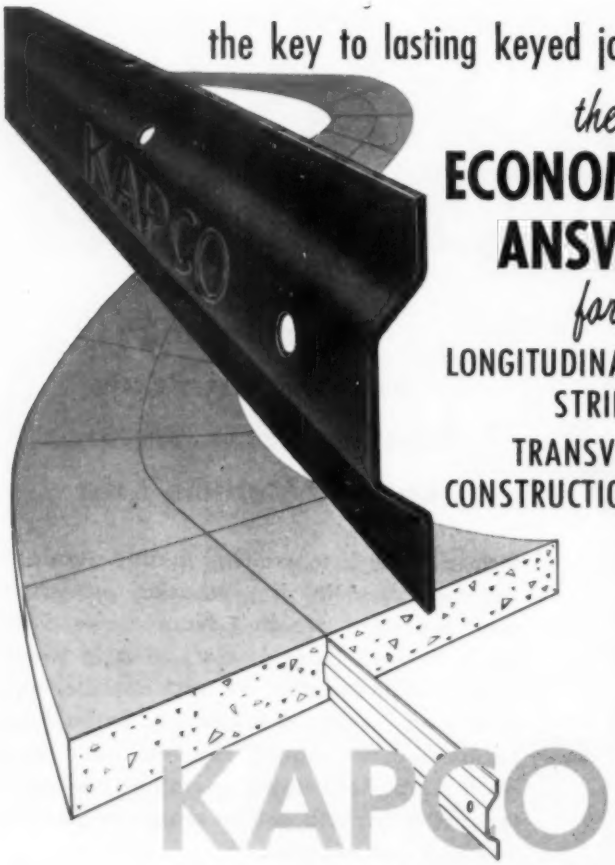
ECONOMICAL ANSWER

for

LONGITUDINAL CENTER STRIPS

TRANSVERSE CONSTRUCTION JOINTS



TONGUE and GROOVE JOINT

DURABLE IN SERVICE:

Preformed mastic composition absorbs expansion of slab — without extrusion. An effective, efficient bearing surface between slabs to prevent spalling at joint surfaces. Won't rust or rot.

RIGID:

More than sufficient strength to resist deforming forces of concrete placement . . . yet lightweight and easy to install.

WEATHERPROOF:

Won't rust or rot; absorbs no more than 8% water by test.

ECONOMICAL:

Less expensive than steel. Proved over the years on the basis of its high efficiency as load transferring medium.

Be Sure To See Us at the A.R.B.A. Show
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PRESSTITE Sealing Compounds

PRESSTITE-KEYSTONE ENGINEERING PRODUCTS COMPANY

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A Division of AMERICAN-MARIETTA COMPANY

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. . . for more details circle 246, page 16

Headlines

(Continued from page 36)

Three courses are planned: (1) Operation and maintenance of crawler tractors, dump trucks, loaders and scrapers; (2) motor graders; and (3) all-inclusive instruction covering all machines.

Cost of the 200-hour, five-week, crawler tractor instruction course is $295; with the 160-hour, four-week, motor grader course listed at $225; while the comprehensive, 320-hour, eight-week course is $460.

Students enrolled in crawler tractor and motor grader courses will be given 24 hours of instruction jointly on engine theory and 16 hours on preventative maintenance. In addition, crawler tractor students will receive 40 hours of intensive training in such important subjects as: Dump operation and maintenance, plus crawler tractor, Hough Payloader and scraper operation and maintenance.

The length of the courses are minimum estimated requirements to produce good operators, the Greer school said, while tuition fees have been set low to permit a large enrollment. Living quarters are available nearby at nominal cost. At a later date, dormitories will be constructed on the grounds.

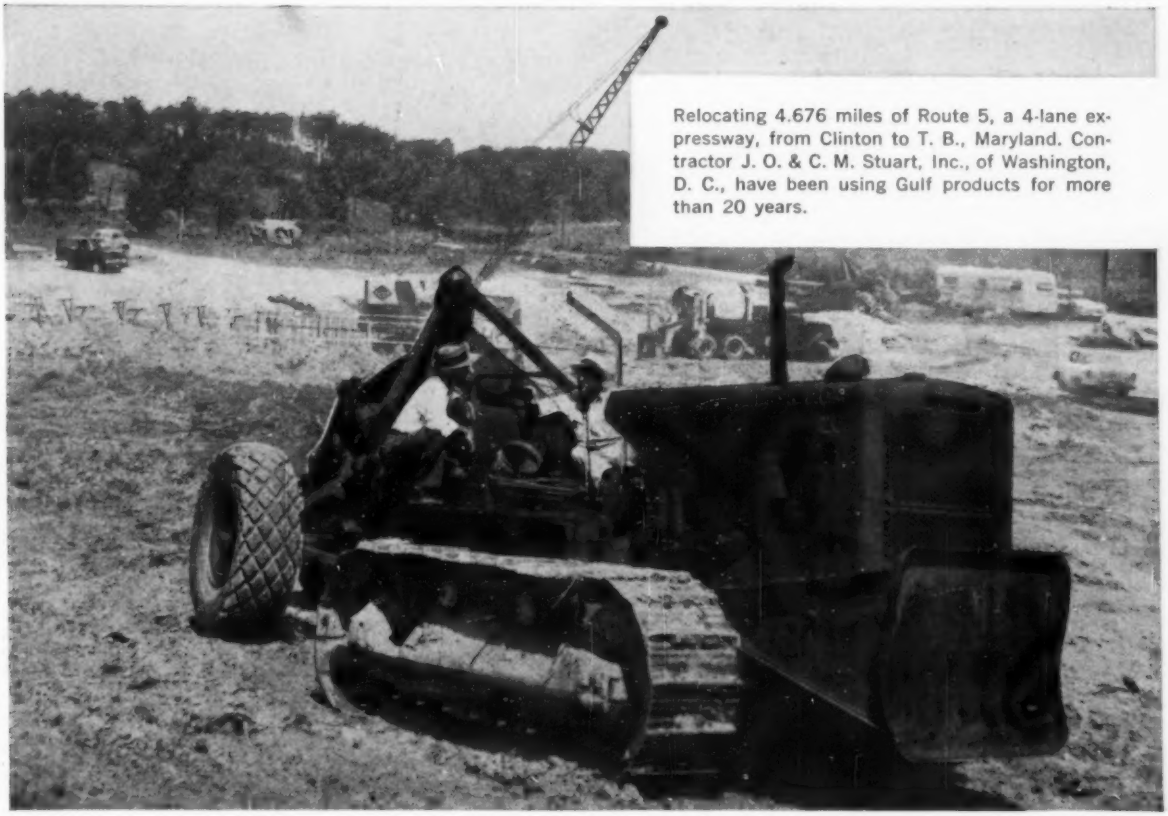
Students are required to submit $50 with their applications, with the balance due upon enrollment.

● **International Drott TD-14 skid-shovel loads a Model S-164 International dump truck in a typical industrial application. Greer instructors shown in white coveralls, guide students through proper loading procedures.**

(See page 42)

GULF PRODUCTS *and* FINE SERVICE

keep equipment rolling on Maryland Expressway



Relocating 4.676 miles of Route 5, a 4-lane expressway, from Clinton to T. B., Maryland. Contractor J. O. & C. M. Stuart, Inc., of Washington, D. C., have been using Gulf products for more than 20 years.

On this expressway relocation project, contractor J. O. and C. M. Stuart, Inc., use nothing but Gulf products.

The Stuarts have been Gulf customers since 1935 . . . because they know they can always depend on Gulf for quality products, helpful petroleum engineering counsel and prompt delivery. They use Gulf Dieselect Fuel and Gulf Super Duty Motor Oil for their diesels . . . Gulfpride Oil for their trucks . . . Gulflex A, the multi-purpose grease, for all automotive equipment . . . and tough Gulf Lubcote to protect open gears and wire rope on the job.

1400 Gulf warehouses are at your service, too. Why not find out exactly how they can serve you? Send the coupon now for your copy of the new booklet "Gulf and Your Business."

GULF

Gulf Oil Corporation • Gulf Refining Company
1822 Gulf Building, Pittsburgh 30, Penna. RS

Without any obligation on my part, send me a copy of the new booklet "Gulf and Your Business."

NAME_____

TITLE_____

COMPANY_____

CITY_____ ZONE____ STATE_____

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

. . . for more details circle 214, page 16

TWO LOAD-SPEEDING International® "95"

average 2400 cu. yds. of rock

TWO-TON CHUNKS OF LIMESTONE bang down into the huge Payhauler body—the rugged high-tensile steel sides, triple-section bottom, and super-duty "spring cushions" are built to take rock-shock! And the "95" Payhauler frame is strongest known of any off-highway truck in its class.

WITHOUT LOSING A SWING, 3 cu yd shovel always finds "95" waiting for load. Powerful, fuel-saving 335 hp Turbo-charged diesel engine keeps power high, reduces fuel consumption 10% or more. Maximum engine torque is transmitted efficiently through new cerametallic clutch and shock-saving planetary final drive into greater pay-off work power!

BODY UP... DOWN... IN ONLY 12 SECONDS! Three-stage, double-action hydraulic hoist provides full-time power control. Built-in hydraulic snubber valves assure smooth, over-center dumping action and gentles body return. Proper weight distribution permits safe dumping at edge of fill, yet drive wheels carry ample weight for steep-grade traction.

NO FOOT-BRAKING DOWN-GRADE! Heap-loaded "95" Payhauler rolls along safely down to the fill at 10 mph. Hand-operated Torqmatic brake, "torque converter in reverse," is standard equipment, gives accurate, confidence-building control at any speed...on any grade. Earl and Roy Schenewerk, operators of the "95's," say, "Because of Torqmatic brakes, these Payhaulers operate easier, smoother and safer than any other unit we've ever driven. Now, we have no worry on this steep grade."

Payhaulers

per 10-hour day!

"Best Production I've ever had,"

Says H. D. **BROWN**
Project Superintendent,
Clarkson Construction Co.,
Kansas City, Mo.

High speed (up to 38 mph.), 16 cu yd capacity, and next-to-automatic operating control of two new International "95" payhaulers are getting Clarkson Construction Co. record-breaking rock production of 2400 cu yds per 10-hour day. Payhaulers are producing this outstanding yardage on the company's 1000-foot cut through dolomite limestone—part of their 7.5 mile, 2-lane highway contract between Bonne Terre, and Halifax, Mo.

The Payhaulers are operating on a 2000-foot cycle which includes a 12% grade. On this grade, too tricky and treacherous for Clarkson's other rock haulers, Payhaulers maneuver speedily and safely downgrade—under positive Torqmatic braking control! Payhaulers' high speed of up to 38 mph also permits the fast average round-trip travel time of only 2 min, 45 sec. That's faster than the 3 cu yd shovel can load one!

H. D. Brown, Project Superintendent, says, "The Payhaulers have got all other rock trucks beat. Control we've had with Payhaulers on this job is something we didn't have on any other truck. We've averaged 150 to 162 loads of 16 to 18 cu yds per 10-hour day. It's the best production I've ever had!"

Other veteran rock men who have used or seen the International "95" Payhauler in action say the same thing. You'll join them, too! Ask your nearby International construction equipment distributor to give you a demonstration.

INTERNATIONAL HARVESTER

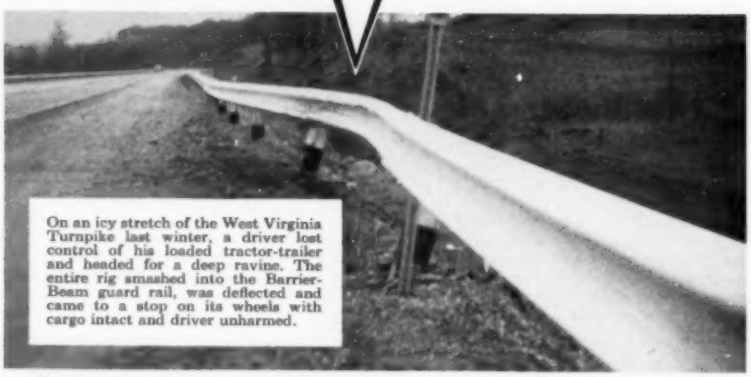
INTERNATIONAL® Construction Equipment

International Harvester Company, 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Boom Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Trucks . . . Diesel and Carbureted Engines . . . Motor Trucks

. . . for more details circle 219, page 16

Saved... a LIFE, a cargo and a complete rig!



On an icy stretch of the West Virginia Turnpike last winter, a driver lost control of his loaded tractor-trailer and headed for a deep ravine. The entire rig smashed into the Barrier-Beam guard rail, was deflected and came to a stop on its wheels with cargo intact and driver unharmed.

Specify USF BEAM-TYPE GUARD RAIL

BARRIER-BEAM

A rugged deep beam section with the famous rounded Safety-Top, noted for high impact strength, good deflection, maximum protection and ease of installation and maintenance.

UNIVERSAL-BEAM

A standardized interchangeable deep beam rail having turned-back edges and featuring easy erection, strength, and simplification of purchasing, stocks, and maintenance.

Write for Literature

USF UNITED STEEL FABRICATORS, INC.
WOOSTER, OHIO
USS STEEL PRODUCTS
Hollow Metal Doors • Prefabricated Metal Buildings • Window Wells
Highway Guard Rail • Bridge Flooring • Corrugated Metal Pipe
Sectional Plate Pipe and Pipe Arches

. . . for more details circle 262, page 16

Headlines

How to stay in the construction business

This is the title of an address recently made by Hal C. Dyer of the Dallas AGC, who has for six months been making an intensive study of the subject of costs and profits in the industry.

Quoting the statistics furnished by Dun & Bradstreet, he notes that in construction the general contractor has been hit hardest for failures in this branch of the industry are 63.4% greater in 1956 than in 1955. This comes in the midst of one of the greatest construction booms ever known to man and is almost unbelievable. He indicates that if you will carefully analyze your business and be honest with yourself many of you will find you are not doing so well.

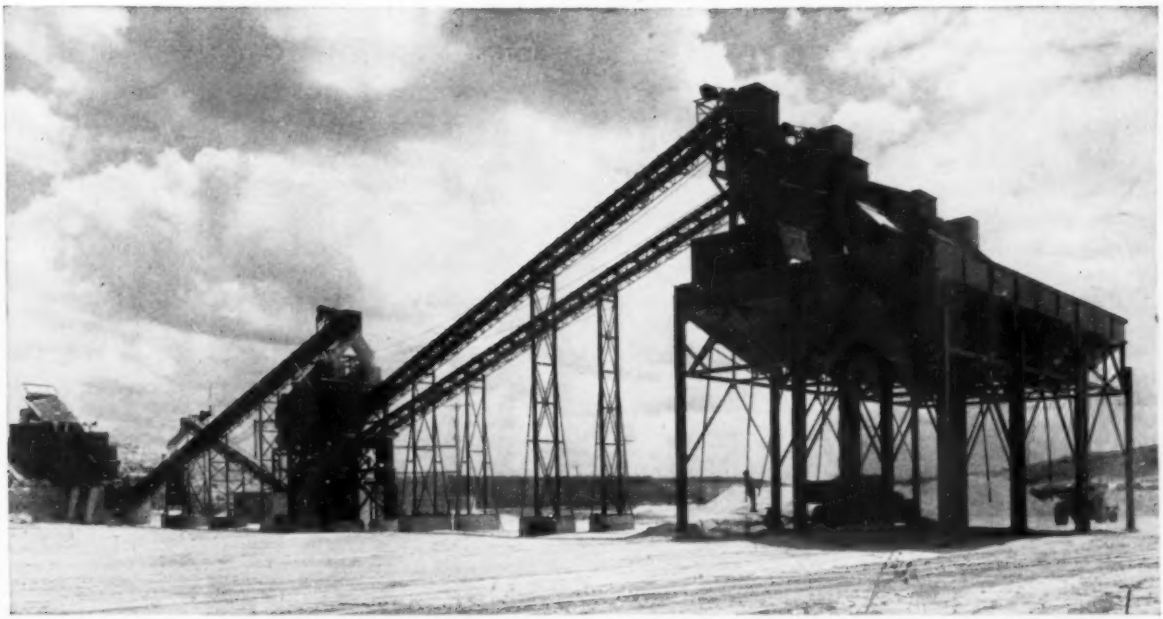
The most talked-of reason is the keen competition, yet, he points out, that competition is a part of our business and a part of our individual make-up. He comments that when any bidder gets the idea he has to cut his bid because old Joe Doaks is out of work and will hit the job hard, the price is certain to go down and too often the low bidder is too low. His recommended solution for such practice is to forget all about Joe Doaks, figure the cost correctly, add reasonable profit and the chances are good that you will do all right.

True, you will not get as many jobs, but you will do far better profitwise and you are certain to reduce the risk and the efforts involved. He cites overexpansion as another reason why the contractor is not making money and states that no contractor should take on more work than he can properly finance through his regular banking connections. He notes that when a contractor gets himself in a position as a result of too many jobs that causes him to take the estimates from a current job to pay off the retainers on a job just completed, he is headed for serious trouble.

When a contractor's payrolls are so heavy compared to his cash reserves that he cannot discount his material invoices, or is forced unduly to ride his subs, he would fare much better with less work.

A contractor who consistently operates within his limits, discounts his invoices and has a reasonably efficient operation will soon establish a good line of credit at the bank at an attractive interest rate.

(Continued on page 46)



This is a complete Universal-engineered plant operating in the Limestone quarry of McDonnough Brothers, Inc. near San Antonio, Texas. Of the Universal plant, Mr. McDonnough said, "We consider it the best engineered plant available".

"600 tons per hour 100% passing 1½" screen with our Universal 4650 Impact Master"

Says Mr. James P. McDonnough, president, McDonnough Brothers, Inc.. San Antonio, Texas

The Universal 4650 Impact Master. In-fed rock is reduced by a smashing blow from two rotor hammers turning in the same direction. Material moves forward and out by straight-line action.

"WE PURCHASED a complete Universal plant, including the 4650 Universal Impact Master for our limestone crush because we consider it the best engineered plant available. And we consider the Universal Impact Master the best operating crusher.

"We have, so far, produced 600 tons per hour of 100% crush passing 1½" screen with our Universal 4650 Impact Master. We have not yet come close to the capacity limits of our new plant, but are confident that we are equipped to crush at least 800 tons per hour.

"In 1951 we purchased a Universal Impact Master (Model 3042) for crushings mainly in 7/16" size, for limestone used in asphalt and chemicals. Continuous operation of this plant for six years has given us an excellent opinion of the worth of Universal equipment and was a determining factor in our purchase of a complete new Universal-engineered plant this year."

Aggregate producers everywhere look to the Universal Impact Master for top production in all types of material. It gives them more uniform gradation . . . top quality cubical aggregate with minimum wear and maintenance. Universal equipment is engineered for the rock crushing industry by men who know rock crushing equipment.

Write for complete information on the Universal Impact Master today.

PETTIBONE UNIVERSAL
In Cedar Rapids Since 1906

UNIVERSAL ENGINEERING CORPORATION
631 C Avenue, N.W., Cedar Rapids, Iowa
A subsidiary of Pettibone Mulliken Corporation, 4700 W. Division Street, Chicago 51, Illinois

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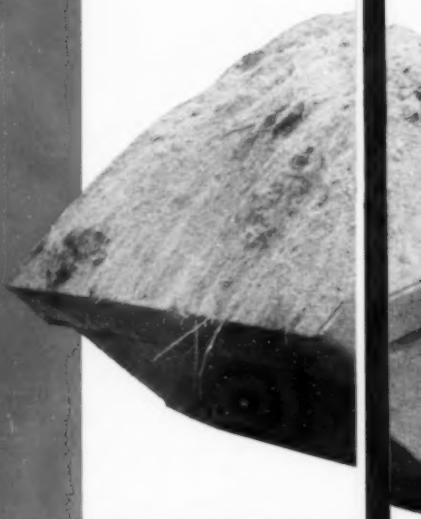
EXCLUSIVE...NEW...

International®-Drott® TD-18

3-yd 4-in-1



Here's the big one of the famous International Drott Four-In-One Skid-Shovel family; the new 3-yard TD-18 Four-In-One! Its bucket of ½-inch new T-1 alloy steel equals ½-inch high tensile manganese steel in strength—saves a ton of weight—boosts your production! And like all Four-In-Ones, this one completely eliminates the need for switching attachments!

It's a 3-yd. Skid-Shovel...

with Drott's exclusive "concrete-shattering," triple-power pry-over-shoe break-out action—and 42° ground level bucket roll-back. Skid-Shovel position also gives you time-gaining, strain-saving load transport on the exclusive Skid-Shoes!

It's a 3-yd. Clamshell...

that "surrounds" loose materials and fills in one fast gulp. And the bottom-dumping clamshell gives you a 2½-foot dumping height advantage over ordinary roll-forward buckets—plus positive, clean-out action even when handling sticky materials!

"FLEET-BEATING PERFORMER"

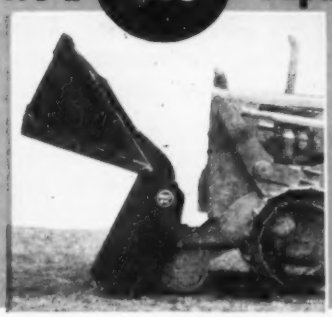
"A new 3-yd. TD-18 4-In-1 Skid-Shovel proved able to do as much work as 3 power shovels and a dragline digging up and loading old concrete pavement on one of my recent highway jobs," reports Henry E. Berghuis, Prinsburg, Minn. "The 4-In-1 loaded up to 1,700 lineal feet of old pavement daily. Using 4-In-1 Clamshell bottom dumping, I also loaded out 4,500 yards of wet, sticky gumbo no other loader could tackle."

NOW.. big-scale four-machine utility!

It's a 3-yd. Bullclam...

that gives you regular "carry-type scraper" action to grade, strip or spread with inch-close accuracy, using clam lip control. *Plus* exclusive Drott Bullclam efficiency on all Sanitary Landfill operations including *positive fill compaction!*

It's a BIG-capacity Bulldozer



with clam lip up, and shoes on the ground, the blade rolls the earth with precision. You regulate dozing depth with ease and accuracy by hydraulic "radius control" of blade pitch (forward and backward).

Touch the new 3-yard TD-18 Four-In-One's machine-selector lever! See how you instantly get any material-moving action you need—from the seat, with finger-tip ease—and stopped or on-the-go. Prove you can beat a fleet of limited-duty rigs with this *versatility unlimited*—get big-income, tough jobs other rigs can't handle! Compare the capacity-adding advantages of Drott exclusives like shock-swallowing Hydro-Spring and heap-keeping, parallelogram raise action. See your nearby International Drott distributor for a TD-18 Four-In-One demonstration. Or try the 1-yd. TD-6, 1½-yd. TD-9, or 2¼-yd. TD-14 Four-In-One!

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

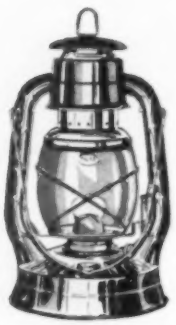
INTERNATIONAL HARVESTER

INTERNATIONAL®
DROTT

See you at the
ROAD SHOW—CHICAGO
Jan. 28-Feb. 2, 1957

. . . for more details circle 278, page 16

"750" Torch — up to 40 hours of clear, bright flame — highly visible near or far. Leak-tight, rough and tough.



"Little Wizard" — provides steady wind-defying red light up to 30 hours. Burns bright, stays bright to the last drop!

... with **DIETZ WARNING LIGHTS**

Your reputation, financial position and your insurance rates are at stake everytime the public passes your project.

You may lose everything if there is an accident due to failing warning lights.

Protect yourself and others with Dietz Warning Lights. Reliable and dependable . . . Nothing to wear out or fail . . . and at low cost to you.

INSPECT YOUR PRESENT WARNING LIGHTS

Are you positive they'll function perfectly under all conditions? Let your Dietz distributor help you check.

R. E. DIETZ CO.

102 Leavenworth Ave. Syracuse 1, N. Y.

IT'S ALWAYS **DIETZ** FOR *Safety* LIGHTING

... for more details circle 196, page 16

Headlines

How to stay in business

(Continued from page 42)

Mr. Dyer states that he has found more spread between the low and second bidders than between second and fifth with the wide difference usually occasioned by misinterpretation of the plans or specifications, mistakes in plain arithmetic, or by overlooking job site conditions. He suggests that arrangements be made where, should the bidder on a job desire to check quantities against those of other bidders, that such a service be made available. We here at the Constructors Association of Western Pennsylvania, have time and again offered the impartial services of the Association for just such a purpose. While the suggestion has met with whole-hearted approval from the membership, and has been lauded as a step in the right direction, we still await the first call for such a service, even from those members indicating it to be highly desirable.

Naturally, no unit prices or amounts of bids would ever be discussed. Quantities, hazardous site conditions or unusual requirements of the plans and specifications would be the only information exchanged. In conclusion, Mr. Dyer exhorts all contractors to exercise good business sense and have guts enough to put a reasonable and fair profit on an accurate and realistic cost which, come to think of it, would have made the article concerning dues uncalled for if our members were following this sound advice.

(From Bulletin 272, Constructors Association of Western Pennsylvania)

Personals

W. A. Warrick, former chief construction engineer and deputy secretary for the Pennsylvania department of highways, has joined the firm of John Clarkeson, Consulting Engineer. Mr. Warrick, who retired from the Pennsylvania Department in May, will serve as a regional engineer for Clarkeson, in charge of all work for the firm in New York, Connecticut and Pennsylvania.

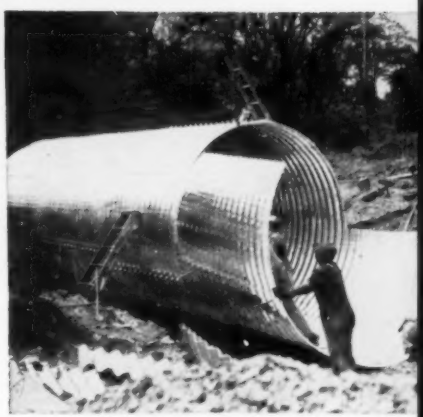
Associated with the Pennsylvania Department of Highways for more than 30 years, Mr. Warrick has been

(Continued on page 48)

NOW AVAILABLE

AMBRIDGE Sectional Plate

for any shape or size of pipe, arch, or pipe-arch



to save you time and money in building low-cost drainage structures

AMBRIDGE Sectional Plate for Pipes, Arches and Pipe-arches is fabricated to meet the specifications of the American Association of State Highway Officials and can be adapted to all state, railroad and government specifications.

The plate is fabricated with 2" deep corrugations on 6" centers with standard punching, *and galvanized after fabrication.*

AMBRIDGE Sectional Plate is furnished to accommodate any shape or size of pipe, arch, or pipe-arch, complete with bolts. Special details, such as asphalt coating, hook bolts, beveled ends, and skewed ends, are furnished as specified for each job.

For further information, we suggest that you contact the office nearest you. Or, an inquiry direct to our Pittsburgh headquarters will bring detailed information.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION • GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.
Contracting Offices in: AMBRIDGE • ATLANTA • BALTIMORE • BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • ELMIRA • GARY
HOUSTON • LOS ANGELES • MEMPHIS • MINNEAPOLIS • NEW YORK • ORANGE, TEXAS • PHILADELPHIA • PITTSBURGH • PORTLAND, ORE. • ROANOKE • ST. LOUIS • SAN FRANCISCO • TRENTON
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

AMBRIDGE *Sectional* **PLATE** USS

UNITED STATES STEEL

3 exclusive features

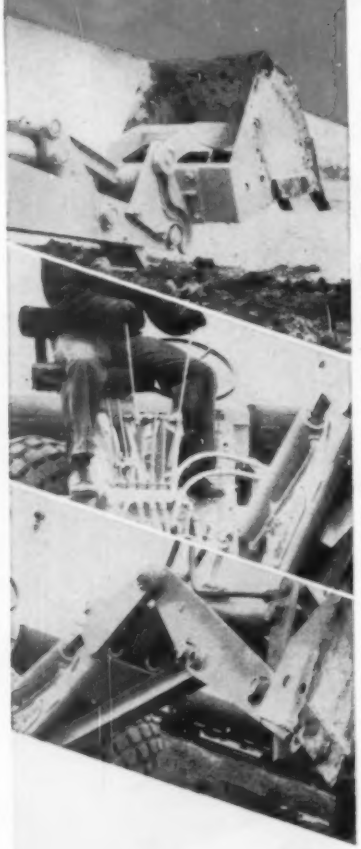
FASTER OPERATION

EASIER HANDLING

MORE POWER

On Your OTTAWA

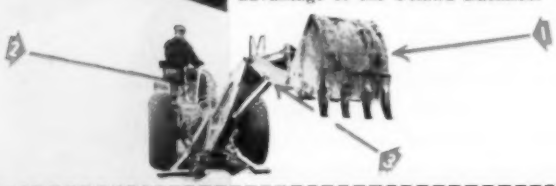
HEAVY-DUTY BACKHOE



1 THE AUTOMATIC EJECTOR BUCKET on the Ottawa heavy-duty Backhoe forces all wet, sticky material from the bucket automatically — in the dumping cycle of the bucket. No extra control is needed. This speeds work during the rainy season—speeds work when material has a natural tendency to stick or wedge in the bucket . . . and it's exclusive with the Ottawa Backhoe.

2 ONLY 2 LEVERS ("One-Trols") DO FOUR OPERATIONS. There's no fumbling! Just 2 levers on the Ottawa heavy-duty Backhoe control the dig, hoist, swing and bucket action. This speeds up the cycle time in all phases of the Backhoe operation — provides smoother, easier, quicker handling by either skilled or unskilled operators . . . and it's exclusive with the Ottawa Backhoe.

3 MORE POWER WITH THE "BIG MUSCLE" The patented "Big Muscle" feature on the Ottawa heavy-duty Backhoe *combines* the use of a powerful hydraulic system with mechanical linkage to provide more digging power than is normally possible with the general run of hydraulically operated backhoe. This, too, is an exclusive advantage of the Ottawa Backhoe.



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OTTAWA STEEL DIVISION
L. A. Young Spring & Wire Corporation
Ottawa, Kansas

Please send me without obligation complete information on the Ottawa heavy-duty Backhoe:

NAME _____ 36

ADDRESS _____

CITY _____ STATE _____

Ottawa

OTTAWA STEEL DIVISION
L. A. Young Spring and Wire Corporation
50 Years of Progress — 1906-1956
OTTAWA, KANSAS

. . . for more details circle 243, page 16

Personal

(Continued from Page 46)

a prominent figure on industry committees including: chairman of the construction committee, American Association of State Highway Officials; and co-chairman of the AASHO-AGC joint cooperative committee. The firm of John Clarkeson, Consulting Engineer, is associated with Clarkeson Engineering Co. Inc., of Boston.

CLIFTON W. ENFIELD has been appointed Solicitor, Bureau of Public Roads, Washington, D.C. He has served as Chief Counsel, Oregon State Highway Commission and Assistant Attorney General of Oregon. Mr. Enfield's appointment, according to a statement by Secretary of Commerce Sinclair Weeks, is part of the program to speed the National Highway Program, with special reference to the many legal responsibilities and problems. He is a member of the Highway Laws Committee of the Highway Research Board and other national committees on this kind.

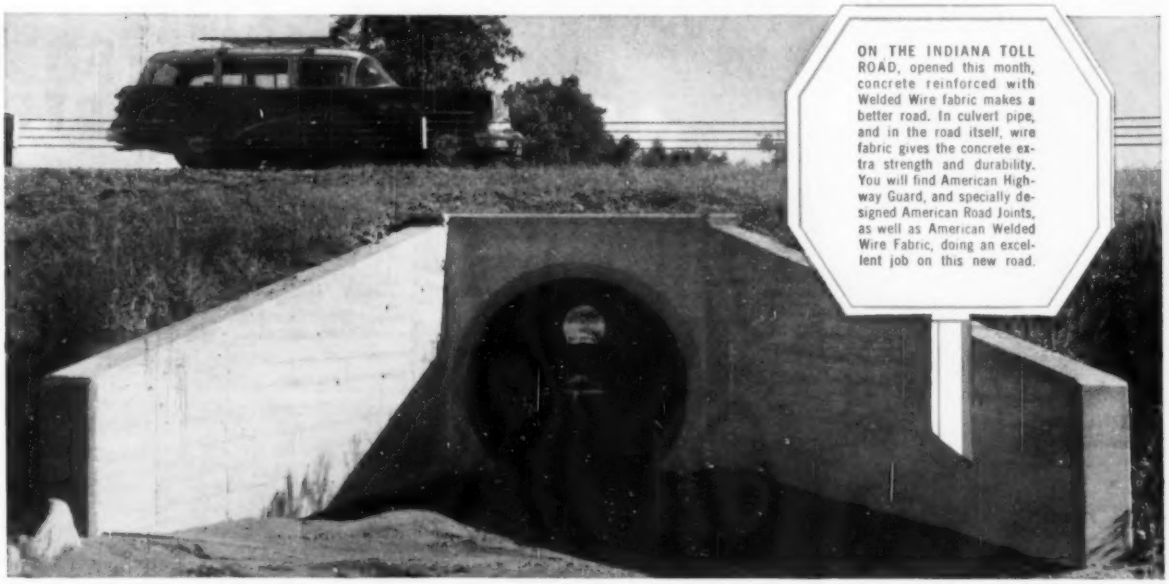
KENNETH A. GUTSCHICK, formerly Associate Editor of Rock Products, has joined the technical staff of the National Lime Association, Washington, D. C.

Kenneth A. Gutschick

W. E. HAWKINS, state construction engineer in North Carolina for the past 15 years and R. Getty Browning, chief locating engineer have retired. Hawkins has been in highway construtions work for 47 years, noted chief highway engineer W. H. Rogers, Jr., in announcing the retirement. Browning is expected to be retained as a consulting engineer.

Lloyd H. Cook, senior locating engineer, has been advanced to succeed Browning, and Hunter D. Irving, division engineer at Durham, has been named to succeed Hawkins.

Highly Stressed Concrete Lasts Longer
when reinforced with
American Welded Wire Fabric



ON THE INDIANA TOLL ROAD, opened this month, concrete reinforced with Welded Wire fabric makes a better road. In culvert pipe, and in the road itself, wire fabric gives the concrete extra strength and durability. You will find American Highway Guard, and specially designed American Road Joints, as well as American Welded Wire Fabric, doing an excellent job on this new road.

Concrete roads, floor slabs, pipe, walls, sidewalks—all are improved with Welded Wire Fabric reinforcement. They have greater resistance to cracking, last longer, and stay smoother. And now, for concrete that must withstand unusually high stresses, American Welded Wire Fabric comes in larger sizes than formerly. It's now available in diameters up to and including ½", at 2", 3", 4", and 6" on center. It meets ASTM Specification A 185 56T.

The high quality of American Welded Wire Fabric is rigidly controlled from iron mine to you. Made from tough, cold-drawn steel . . . then electrically welded together into a strong network of durable reinforcement, it cuts maintenance cost because it increases service life of concrete. It cuts *installation* costs because it is easily handled and placed. It comes in both sheets and rolls. Send the coupon for helpful literature on this and other construction materials manufactured by American Steel & Wire.

AMERICAN STEEL & WIRE
DIVISION
UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

IT PAYS TO ASK
"is it Reinforced"
USS American Welded Wire Fabric
UNITED STATES STEEL

FREE TECHNICAL DATA

American Steel & Wire
Dept. 56-C, Rockefeller Bldg.
Cleveland 13, Ohio

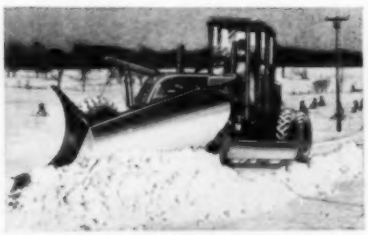
Please send complete information on the following products:

- ☐ American Welded Wire Fabric for Portland Cement Concrete
- ☐ American Welded Wire Fabric for Asphaltic Concrete
- ☐ American Welded Wire Fabric for Airport Runways
- ☐ American Wire and Strand for Prestressed Concrete
- ☐ American Road Joints
- ☐ Multisafty Highway Cable Guard
- ☐ American Beam-type Highway Guard
- ☐ Have your representative call

Name .....
Firm .....
Address .....
City ..... State.....

. . . for more details circle 279, page 16

When You Want ... THE MOST GRADER for the least money.



GALION Model 503 MOTOR GRADER

STANDARD FEATURES

- Positive, 4-wheel tandem drive.
- Hydraulic controls.
- High-clearance front axle.
- Gasoline engine — 50 h.p. (Diesel engine available).
- Four forward speeds, 2.3 to 20.4 m.p.h.; reverse 3.38 m.p.h.
- Front and rear tires 7.50 x 20 (8.25 x 20 available).

PERFORMANCE-BOOSTING ATTACHMENTS AVAILABLE

- Hydraulic shiftable moldboard.
- Hydraulic circle turn.
- Leaning front wheels.
- Windrow eliminator.
- Stand-up height steel cab with full-view safety glass.
- Front-positioned hydraulic scarifier.
- "V" snow plow — independently operated.
- Bulldozer — independently operated.

Write for literature.

A ONE-MAN, ONE-MACHINE MAINTENANCE DEPARTMENT

The Galion Model 503 Motor Grader is a high-quality, high-performance grader at a low-budget price. It is especially designed to meet the requirements of Contractors, Federal Agencies, States, Counties, Townships, Cities, etc.; also for maintaining haul roads in the timbering, mining, and petroleum fields.

On new construction there are many lighter types of work on which the Galion 503 will save thousands of dollars in investment and operation over what it costs to do the same work with heavier graders.

ESTABLISHED GALION 1907

BUILT FOR A GREATER AMERICA

See you at the ROAD SHOW CHICAGO Jan. 28-Feb. 2, 1957

MOTOR GRADERS · ROLLERS

TRENCH ROLLERS · PORTABLE ROLLERS · 3-WHEEL ROLLERS · TANDEM ROLLERS · MOTOR GRADERS

THE GALION IRON WORKS & MFG. CO., General and Export Offices, Galion, Ohio, U.S.A.
Cable address: GALIONIRON, Galion, Ohio

. . . for more details circle 207, page 16

Is This a Record?

75 Miles of Streets in One Joint Venture Contract

Unique city-wide program being handled by three local contractors in joint venture, each firm taking one part of city under a coordinating project manager. Existing improvement being incorporated on a spot-to-spot basis where found to be structurally sound.

By H. K. Glidden,
Contributing Editor

JUST how it happened is another story, but the city of Great Falls, Montana, found itself in the summer of 1956, with 75 miles of city paving under way. This one improvement district, as far as can be determined, is the largest single improvement project of its kind ever programmed in the United States.

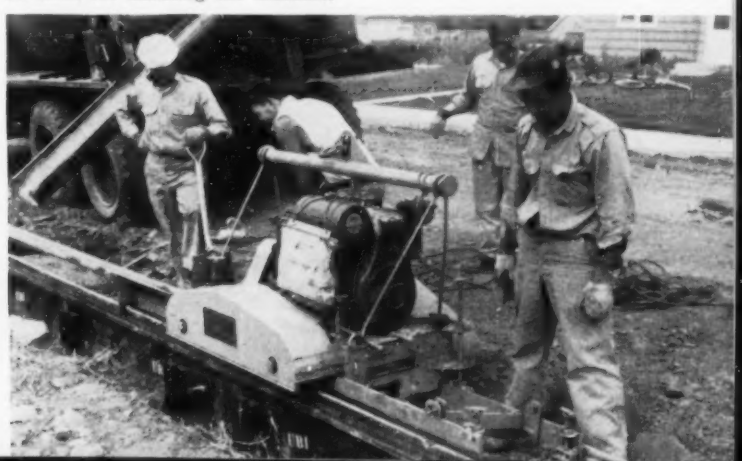
The project called for paving sprucing up practically all of the streets in Great Falls with the exception of a small section comprising the downtown business district. A resolution authorizing this special improvement district set the cost ceiling at $5 million. In addition to this street pavement financing, the city had previously voted a bond issue of $2,285,000 to bring its storm and sanitary sewer system completely up to date. The sewer construction was carried out ahead of the street pavement. Great Falls was truly torn up from one end to the other, but everyone took it gracefully and seemed pleased that the city had finally taken steps to rid themselves of a long-standing street problem.

This ambitious project was sparkplugged by the Great Falls Kiwanis Club under the leadership of its public works committee chairman, Kenneth Knight. The Kiwanis launched their program in August, 1954, finished securing petition signatures before Christmas of that year, and saw the project immediately put into effect by newly-elected city officials in May, 1955.

The engineering firm of Harold Hoskins & Associates of Lincoln, Nebraska, was selected in June, 1955, to push through a comprehensive investigation and submit a report sufficiently accurate to allow a close approximation of construction cost. Hoskins & Associates submitted their report in November of 1955, and the construction contract was awarded the following June.

OLD CURB DISPOSAL—Contractor S. Birch, Inc., using a Gradall and a Ford Big Job F7 truck for removing old curb-and-gutter and sidewalk areas to be reconstructed.

CURB-GUTTER MACHINE—Dotmar unit forming ready-mix, with aid of truck-mounted Kohler light plant and Mall vibrator. Truck (not shown) also equipped with boom and power take-off hoist for handling the machine.



CONCRETE CUTTING—Street widening involves cutting back entrance walks and curb radii at sharp intersection corners. Contractor Louis & Gray used a Champion CS-400.

TREE REMOVAL—Done by S. Birch, Inc., with an Allis-Chalmers HD-20 Tracto-Shovel, loading into a Euclid dump truck which can handle the big stumps.

UTILITY RELOCATIONS—Expedited here by Henry backhoe, mounted on Cat D8 angledozer apron, from which it is excavating for a fire hydrant.

Work commenced July 20, 1956, and is expected to be completely by the fall of 1957. The major items in the contract are as follows:

540,000 cu. yd. unclassified excavation
309,424 lin. ft. concrete curb and gutter
33,530 lin. ft. straight curbing
170,420 cu. yd. sand subbase
339,440 tons crushed base aggregate
178,980 tons asphaltic concrete wearing surface
12,690 tons asphaltic concrete overlay of old pavement
3,020,000 gal. asphalt cement, 120-150 penetration

A variety of drainage structures, mostly catch basins and new inlet covers, accounted for $18,000.

Great Falls boasts of being a contractor's town and does have a larger-than-usual number of well-qualified contractors. When it came time to submit bids on the project, three of Great Falls' largest contractors—Nilson-Smith Construction Co., McLaughlin, Inc., and S. Birch, Inc.—prepared a joint venture bid under the name of City Constructors, Inc. Prior to submitting their bid, this group divided the improvement district into three approximately equal parts on a dollar basis. When it turned out that they were low bidders, they drew lots to determine the area in which each company would work. Their bid on the initial project was $4,186,721.60, some 10% below the next higher bid. They were subsequently awarded two additional projects which included Federal aid in the amounts of $673,582 and $325,722.

City Divides Project

In order to expedite and utilize as much of the Great Falls' contractor experience as possible, City Constructors divided the project into four parts, and the curb and gutter and drains in each of these areas were subcontracted. Utility Builders, Inc., Lewis & Gray, Robertson-Cave, Inc., and Andy & Sons comprised the subcontractors for this phase.

● *Engineering Design.* The engineers were faced with a problem due to the variety of existing pavement and component parts. Most of the existing streets were in "poor" condition. A great deal of the vintage curb and gutter was badly spalled and frequently not set to any workable grade. Storm sewer inlets were not well graded and had an old-fashioned grate which clogged easily. The four corners of nearly every intersection were level, with no allowance for topography. On the other hand, there had been scattered special-improvement districts ranging in scope from new curb to completely new pavement. The engineers' job boiled down to the physical evaluation of existing pavement and making sufficient studies to prepare a paving design for a rather large variety of subsoil types and conditions. Hoskins & Associates will receive a fee of 7.45% as reimbursement for all work involved including construction inspection.

The petition and resolution pertaining to the special-improvement district described the assessment policy. It stated that any existing pavement or its components which, in the opinion of the engineer, was found to meet minimum standards would be left intact and the property owner assessed only for the cost of actual improvements made in front of his property.

Hoskins & Associates utilized the services of the Great Falls engineering firm of Wenzel & Co. to perform the survey work necessary to locate intersection grades and property lines, and perform other location details. Hoskins' local representatives took soil and material samples and forwarded them to Western Laboratories, Inc., of Lincoln, Nebraska, for analysis.

The magnitude of the engineers' work is indicated by the fact that the project has required 371 sheets of

plans and about 900 sheets of cross sections. William F. Wendland, Hoskins' resident engineer, utilized a crew of about ten men and bemoaned the fact that more were not available to hire.

In addition to the plans, specifications, and construction inspection, Hoskins' contract calls for preserving or replacing about 500 monuments within the improvement district. Bill Wendland made every effort to see that all of the original monuments were located before they could be disturbed by the contractor's activity. The monuments were tied in on each of the four corners of the street intersection and relocated below the lowest excavation grade. New monuments consisted of concrete cylinders with brass pins. During paving operations a cast iron box with detachable lid was installed over each monument flush with the surface.

● *Construction Methods.* City Constructors erected a field office on the south edge of Great Falls and installed R. L. (Bob) Anderson as project manager and Ed Falkner as office manager. All activities were co-ordinated in this central office through Mr. Anderson. However, since each of the three firms which formed the joint venture were in turn subcontractors, their own activities were conducted from their respective offices and with their own equipment.

In order to better coordinate the activity of the three subcontractors, an executive committee was formed consisting of Al McIntyre, vice president of S. Birch, Inc., C. S. (Red) Muir, general superintendent, McLaughlin, Inc., and Cliff Craig, general superintendent, Nilson-Smith. The meetings of the executive committee are informal and took place as and when necessary to handle situations which arise.

TAMPING CURB BASE—This chore was expedited here by use of a Barco Pegson Rammer. Subconstractor is Robertson-Cave, Inc.

● Another subcontractor tamped curb base with an Ottawa Hydrahammer.

At the time the project was visited in August, 1956, the only joint purchase of equipment was that of 26 Ford Big Job T-750 trucks equipped with 8 to 10 yd. dump bodies. The trucks which were divided between the three firms were intended for hauling rock, sand, gravel, earth and hot-mix. One interesting feature was that three different colors were specified—Nilson-Smith taking green, Birch taking yellow and McLaughlin taking red.

● *Removing Obsolete Pavement.* The task of removing old pavement included a variety of items. It started with the removal of all curb or curb-and-gutter considered unsatisfactory by the engineer's appraisal survey. In many instances, all existing curb in a block was removed. In other instances, it was necessary to remove only such sections in a block as had deteriorated

TRENCHING FOR CURB OPENINGS—All contractors in Great Falls program have favored use of a backhoe and front-loader for excavating for curb-and-gutter returns. Davis unit, Ford-mounted, shown here.

● Jay No. 12 Tamper.

LAST-MINUTE PICTURES—Allis-Chalmers tractor-shovel removing excavated material on curb reconstruction.

FORM OILING—All subcontractors on curb-and-gutter work are using an ordinary 5-gal. pressure can for spraying form oil and applying concreting curing compound.

badly or were too far from grade.

The returns at many intersections, either due to street widening or larger radii, required the removal of a large number of trees. Almost every existing drainage structure was removed or rebuilt. The major items were the removal of existing pavement and trenching out for new pavement. Each of the three firms has handled these removal items for its respective area.

For curb removal Nilson-Smith used a Cat D6 mounted loader, which pulled the curb out with the teeth. McLaughlin used a Bucyrus-Erie 22-B with clamshell bucket to loosen the curb. A Cat No. 12 motor grader then plowed them out to where they could be loaded into trucks. Birch used a Gradall Model 2460 which removed the curb as well as loaded it into trucks. All three contractors used trucks to haul the old curb to specified waste areas.

Tree Removal

Tree removal was done by McLaughlin using Caterpillar D21 to pull trees and a Mack truck with 8-in. pole to load and haul away. The Birch Company used an Allis-Chalmers HD-20 Tracto Shovel to pull and load the trees into Euclid dumps. Nilson-Smith's area involved no tree removal.

At the time the project was visited, excavation of the old pavement had just started. McLaughlin had moved in two Cat DW10 scrapers for grading and was planning to bring in at least one Cat DW21. Nilson-Smith began their grading with Cat DW10s. The Birch Co. planned to use an Allis-Chalmers HD-20 with loader and trucks; also, tentatively, a Cat D6 mounted loader and trucks.

Due to the extensive nature of the work and the many contractors involved, it was literally impossible to block off more than a very limited number of streets at any one time without paralyzing traffic. The great majority of the work was carried on in competition with regular city traffic with little effort made to reroute traffic

FINE GRADING—Contractor, Utility Builders, used this home-made device as an excavation template in reconstructing short sections of curb and gutter. Sled-type runners and handle welded on a ½-in. steel plate.

REPLACING SATURATED SUBBASE—Removal of old curb frequently revealed saturated areas requiring excavation and backfilling with granular material. Cat 12 grader and DW 10 tractor with No. 15 bowl seen in background bringing in backfill.

HOT-MIX AGGREGATES—This plant which is supplying a huge tonnage for 1956 and 1957 work in Great Falls, consists of a Cedarapids 2036 primary jaw crusher delivering to a Pioneer 46VE crusher unit.

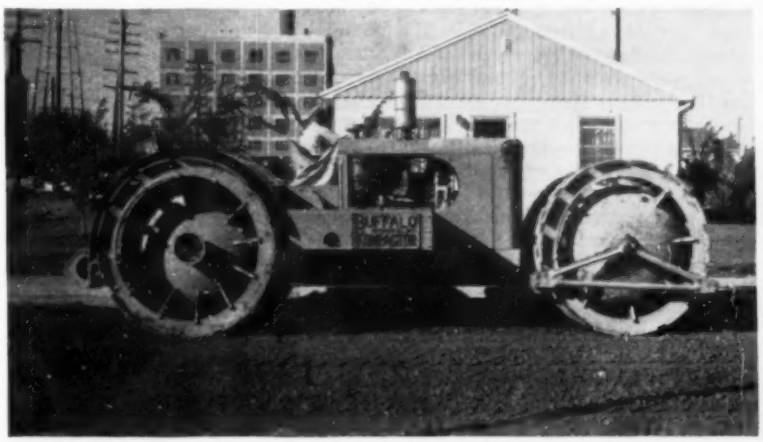
except where absolutely necessary. In addition to loading in traffic, the DW-10s and trucks also competed with normal traffic for right-of-way on the haul streets to the waste areas. In order to minimize the conflict, certain streets were designated as haul streets. The streets chosen were purposely not arterial highways. They were chosen so as to be as convenient as possible to the contractor and were spaced about ten blocks apart in most instances. The contractors posted haul streets as stop streets by installing reflectorized signs at all intersections along the designated routes.

Two problems were involved in disposing of the vast amount of curb and pavement excavation. One was to secure the most economical disposal, and the other to dispose with as much benefit to the city as possible. The old curb was found to be very good for riprapping streets along the Missouri River. The better excavation material was hauled to the city golf course and utilized in a project for an additional nine holes. Other excavation material was used to fill abandoned gravel pits. Great Falls had some low land areas which were built up with the excavation material with the idea that they would provide good industrial sites when reclaimed.

● *New Curb and Gutter.* The four subcontractors who are installing curb and gutter and rebuilding drains have each used their own methods and construction equipment. Conclusions comparing results are difficult except that there was an unanimous approval of curb and gutter finishing machines and the use of small farm trailers for hauling forms. The contractors also concurred in the idea of using a common hand pressure sprayer for applying form oil as well as curing compound. The contractors also agreed on the use of mechanical tampers, but varied widely in the type used. Another universal choice of equipment was the combination of backhoe and loader mounted on a small tractor. This type of equipment was particularly useful in excavating for curb and gutter at returns. (Seen in use on the project were: two Ford tractors mounting Davis Model 101DH loader and 185 backhoe; LeRoi 10 S Tractair with Wagner Model W3 2003 front-end loader; and Henry Model BA8-3 backhoe; Minneapolis Moline Model U tractor with Lull 4C Shoveloader and Model 743 front-end loader; and Cat D8 angledozer mounting Henry Model C-10H backhoe.)

● *Aggregate Production.* By late-summer, 1956, City Constructors had completed their plans for producing aggregate for the pavement subbase, base and wearing surface. Pit-run fine sand for subbase was secured from an existing pit. A Coleman 36-in. loader and Cat D8 dozer loaded material.

To produce material, City Construc-



● Springfield Kompactor on new street base. Photos courtesy Carl H. Christopherson of Harold Hoskins & Associates, consulting engineers on Great Falls street job.

STREET GRADING—Small, shallow dabs of excavation as well as larger yardages were handled with this Cat D8 and DW 20 outfit.

MISCELLANEOUS TOTING—Ordinary farm-type trailer rigs have been popular on the Great Falls street work for miscellaneous light hauling, such as curb-and-gutter forms, here being moved by a John Deere 934 trailer pulled by an International KB-2 pickup.

tors planned to make use of Nilson-Smith's large Universal crusher installed to provide similar aggregate for military airfields near Great Falls. This crusher is set up in a large sandstone deposit.

In preparing for the asphaltic wearing surface, the contractor opened up a new gravel pit south of Great Falls. As used in 1956, a Cat-McCoy-Special U dozer handled all gravel, pushing it to a hopper over the primary conveyor. The primary conveyor delivered to a 4 x 6 double deck screen where the minus-10 fines were removed, thence to a 20 x 36 Cedarapids jaw crusher. A pioneer 3-deck 4 x 12 screen again rejected all minus-10 material, delivering the balance to a standard Pioneer Model 46 VE crusher unit.

The Pioneer 46 VE also wasted a considerable portion of the minus-10 fines. The specifications allowed a maximum of 12% of minus-10 material which for this pit required wasting about 35% of the total output of roughly 200 tons per hour.

A Cat D8800 powered the Cedarapids crusher and 2 Cat Model D315 engine generators provided electrical power. A Cat D13000 powered the Pioneer jaw crusher. The Ford Big Job T-750 trucks together with some hired trucks delivered entire output to a stockpile where hot-plant was erected.

No good use has been found for the wasted minus-10 material. Hoskins & Associates and Western Laboratories, Inc., in early tests of the crushed aggregate showed a high percentage of fractured faces, but also a high amount of stripping in the fine portion. It was asphalt cement. It was for these reasons that it became necessary to reject such a large percentage of the crusher output. Blow sand from a pit near the hot-plant was being used as the fine aggregate.

• *Pavement and Wearing Surface.* The three contractors comprising City Constructors are responsible for all construction in their respective areas through the base course stage. The combine will do all overlay, tack, prime and asphalt work as a unit in 1957. It was anticipated that 25% of the pavement would be completed during 1956 with the balance in 1957.

Heated ramp pavement for Indianapolis airport

The newest snow melting system to be incorporated in an outdoor ramp for automobile traffic was built into this elevated highway serving the new Weir Cook Terminal Building at the Indianapolis Municipal Airport.

More than 25 tons of wrought iron pipe were fabricated into ramp-wide grids by Cook Bros., Indianapolis. Heat is from oil fired boilers located in the terminal. Through an exchanger, SV heat transfer oil will be heated and pumped through piping in tunnels to the wrought iron grids which blanket both ramps.

Because of the considerable grade created by the need to provide access to the second floor of the Weir Cook Terminal Building, considerable pumping capacity was needed to move the light weight oil up and down slopes.

Indianapolis engineer G. M. Williams specified a 7½ hp pump rated at 275 gpm, and three 5 hp pumps rated at 200, 247 and 294 gpm.

While most efficiently operated snow melting systems will produce a clean and dry surface area, the length and grade of this Indianapolis installation influenced special attention to catch basins.

• Snow will have a hot time of it on this ramp for Indianapolis airport.

Control of highway access

A summary of state legislation with 1956 legislative enactments.

A recent report prepared by J. Allyn Preston, National Highway Users Conference, National Press Building, Washington 4, D. C. Copy available on request to this organization.

"Wind, Temperature, Snow Depth— all Snow Removal Cost Factors"

UPPER Michigan countries have been recipients of funds under a state act which provides $500,000 annually for counties having more than 60 in. snowfall per year. Major changes in this act are recommended in a report, following an inquiry into the workings of this act.

As reported by William J. Karas, superintendent and engineer of the Delta County (Mich.) Road Commission, other factors than total snow depth and road mileage directly affect snow removal costs. He suggests that temperatures and wind velocity also be made factors in the fund distribution formula.

"Temperature, a factor so far ignored in past and present formulae," said Karas, "plays as much a part in the total problem as snowfall itself in that the amount of snowfall retained throughout the winter season is maintained by temperatures under 32 deg. and reduced by those temperatures above 32. This factor of retained snow results in higher roadside banks promoting deeper drifts when retained snows are moved by future wind action.

"To point this out," Karas added, "we may use an extreme example where a snowfall takes place at some temperature just below 32 deg. Where normal daily temperature ranges even slightly above 32, this snow will either melt on contact with the ground or will be short lived and melt within a very short time thereafter.

"To remove this snowfall, no expenditure for snow removal is made in the case of melting on contact, and standard light equipment is used to remove the temporary fall of three or four inches. However, under Act 265, this county receives exactly the same credit toward the $500,000 fund as one where this snow is retained because of consistent lower temperatures, and is further jeopardized by future wind action on the retained snow. This fact is true only because the present act measures the snow as it descends and calculates it over that county's entire road system. The injustice is self-evident."

Karas' second factor is wind velocity. "The erosive effect of wind action on new fallen, dry, grandular snow," Karas explained, "creates a continuing costly operation in any area which has retained snow. The conditions promoted by wind action vary in direct proportion to the amount of snow retained from past snowfalls, and it is piled along the roads in the form of banks. It is a known fact that drifted or windblown snows are denser, harder packed and usually, by far, of deeper depth than newly measured falls of snow, and therefore more costly to move. It is this type of resultant condition, more than any other factor, which calls for large, more powerful, costly, specialized standby equipment, and therein needs consideration in any equitable snow removal act formula."

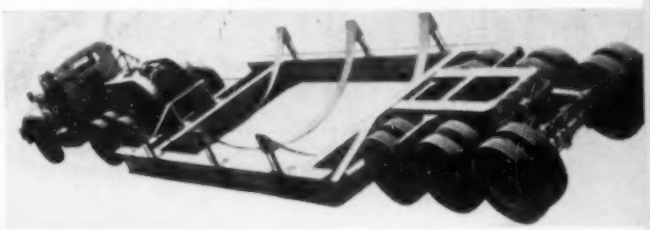
Karas suggesed, in conclusion, that U.S. Weather Bureau collected or supervised data be used in figuring snowfall, and that the minimum Act 265 participating limit should remain at 60 inches of snow.

He suggested a "snow season" of November 1—May 1 for temperature and wind data considerations in a final formula, and that the use of the certified road system mileage figure be continued in a new formula but with a smaller percentage of weight.

"After a personal study of this problem," said Karas, "I feel that at a future appropriate time the Act should be amended as to the present distribution formula. I think a study should be made to determine a reasonable temperature factor which reflects the retention of snow on the ground, and that the $500,000 fund be distributed into three funds, each to be determined separately based on snowfall, temperature below 32 degrees, and mileage."

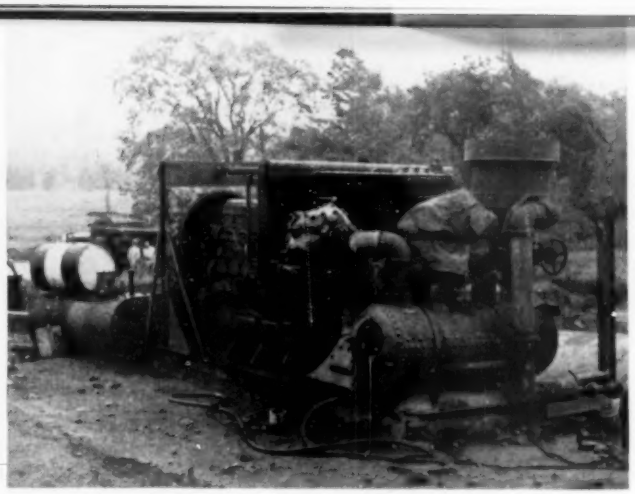
Special Trailer for Oversize Load

Unusual and odd-size loads often require a "special" type of trailer for safe, and economical transport. Recently, Shea-Matson of Milwaukee, Wisconsin, was hired to handle the load shown above from Milwaukee to Tullahoma, Tennessee. To make the move, Shea-Matson called upon Talbert Trailers, Inc., to build the 30-ton Model T3D-30-RG-RA custom trailer illustrated. The trailer assembly incorporated in its construction a removable gooseneck, removable rear axle assembly and removable third axle. The combination allowed the use of the special cradle deck for this one particular move and, also, permitted the interchange of a standard flat deck for normal loads. Built-in jacks on the cradle deck allowed the load to be raised or lowered to clear possible obstructions.



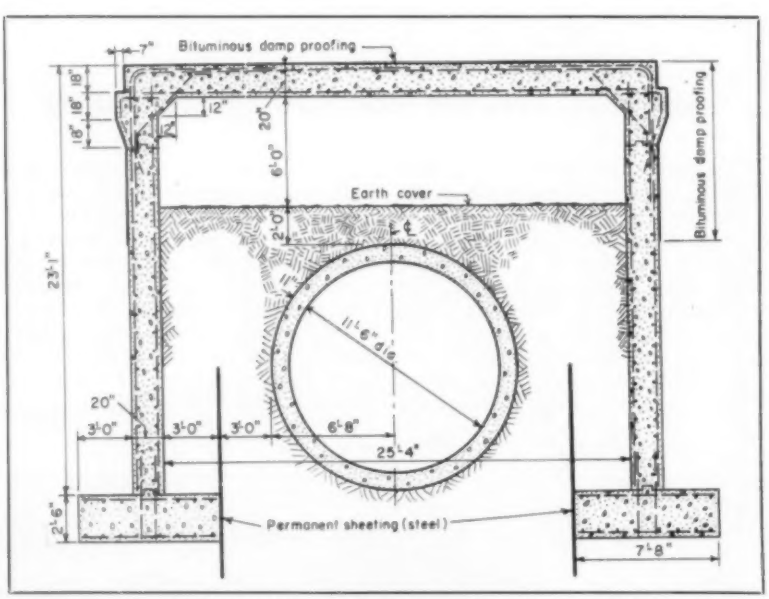
● **Showing the 6-axle assembly prior to loading.**

● **Special Talbert trailer assembly hauling oversize tank.**



● During construction of the aqueduct box. (At Left): Relocated and reconstructed section of pipe with sheeting in place. (At Right): Joy compressor unit which furnished air or pile driver on sheeting and structure shoring.

When Turnpike Meets City Aqueduct



● Cross-section of pipe and box designed to shelter it from superimposed loads and permit entry for inspection or emergency.

CROSSINGS OF highways with municipal aqueducts and other large pipe lines have become a frequent problem today. Such crossings require ingenuity. Pictured here is the solution to such a situation for a junction of the Massachusetts Turnpike and the 11½-ft. Holtman aqueduct bringing water into Boston.

The scheme for this skewed crossing was to carry the big reinforced concrete tube beneath the turnpike right-of-way, housed in a concrete box. Construction of an overpass bridge at the scene made it necessary to relocate and reconstruct a section of the viaduct, to make room for the abutments. Borings were taken to 30 ft. depth to determine the existence of a good foundation for pipe and structures.

The procedure was to excavate the bed and form the pipe, then drive flanking lines of steel sheeting, designed to assure good confinement of the backfill around the pipe. The box footings, walls and roof, were then formed, and select material backfilled and tamped around the pipe within the box, to a height of 2 ft. above the top of the pipe. This level allowed 6 ft. of headroom for inspection of emergency entry.

The job was part of the B. Perini & Sons, Inc., contract section L-14; Clarkeson Engineering Co., section engineers and Howard, Needles, Tammen & Bergendoff, general consultants.

● Manitowoc crane setting H-piles with help of a timber guide frame.

EDITORIAL

Will New Roads Save Live

With the nation's highway death tolls rising year by year, the new Federal Interway Act offers a strong ray of fact

41,000 miles of new expressway be built. They will be wider, st safer roads. Crossings will b eliminated. If speeds are sen there will be fewer acci

IKE SIGNS BIGGEST ROAD BILL EVER

Washington, D. C., June 29. Among some 50 bills signed by the President today was the $32,900,000,000 Federal Interstate Highway Aid bill passed by th

ONE GOAL

Since 1949, Caterpillar, your partner in earthmoving progress, has campaigned for better highways

,000 MILES
E NE
N T'

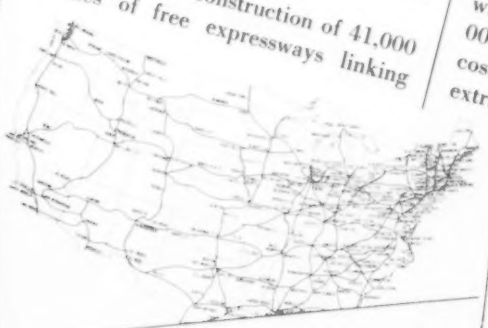
Washingto
President
go-ah

GIANT ROAD BILL SIGNED

$32.9 BILLION HIGHWAY BILL GETS GREEN LIGHT FROM IKE

Washington, D. C., June 29—The largest public works program in history was signed into law by President Eisenhower today.

It calls for construction of 41,000 miles of free expressways linking



practically every large city and state capital in the nation. The building will take 13 years and cost $32,900,000,000. But the huge program will cost the average driver extra

$33 Billion Highway Bill OK'd by Ike

Washington, D. C., June 29. President Eisenhower today signed into law the Federal Interstate Highway bill, largest public works program in history. It provides for Federal expenditures of $32,900,000,000 to build 41,000 miles of superhighway next 13

9500 LIVES SAVED

There were many good and compelling economic reasons for

victim
roads

Re

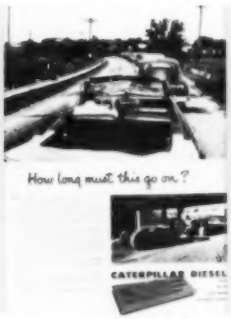
IKE APPROVES BILLIONS FOR NEW HIGHWAYS

Georgia's Share of Highway Funds Over $800 Million

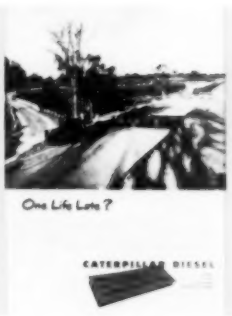
Washington, D. C., July 2. The Government will spend $838,700,000 for highways in Georgia dur the next 13 years, according to

March, 1949

November, 1949



January, 1950



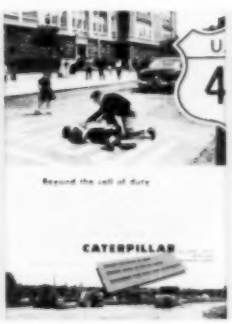
February, 1950

September, 1950

November, 1950

February, 1952

June, 1952

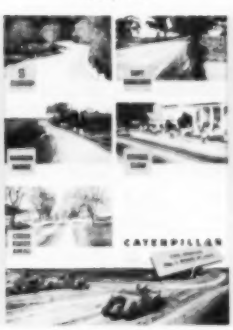


September, 1952

November, 1952

February, 1953

March, 1953



May, 1953

September, 1953

October, 1953

November, 1953

January, 1954

February, 1954

May, 1954

June, 1954

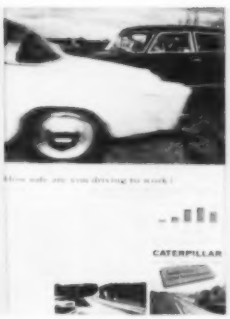
Early in 1949, Caterpillar Tractor Co. began a series of full-page 4-color advertisements in *The Saturday Evening Post* and other national magazines. These pages were designed to forcefully awaken the public to the frightful toll of lives and money taken yearly by inadequate roads.

The 40 advertisements, reproduced in miniature above, give some idea of

January, 1955

February, 1955

March, 1955



April, 1955

May, 1955

July, 1955

September, 1955

October, 1955

November, 1955

December, 1955

January, 1956

February, 1956

March, 1956

April, 1956

May, 1956

June, 1956

July, 1956

August, 1956

September, 1956

October, 1956

the continuing impact carried by this campaign. In the last two years emphasis has been changed to show how various states are meeting the highway problem.

With a strong awareness of highway needs now in the public mind, the new Federal Interstate Highway Program has been enacted into law. The next two pages show a breakdown of probable highway expenditures by states.

Ala. $730,800,000

Ariz. $424,200,000

Ark. $529,000,000

Cal. $2,019,600,000

THE NEW INTERSTATE HIGHWAY SYSTEM AND PROPOSED FEDERAL AID TO STATES

These are the estimated Federal grants to states for the next 13 years, to be used for both the Interstate Highway System and other Federal-Aid roads.

These figures represent 90% of the cost for the Interstate System, 50% for the remainder.

Minn. $829,600,000

Nev. $371,100,000

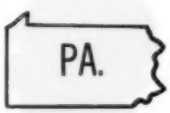
N.H. $204,800,000

N.J. $753,900,000

N.M. $450,700,000

Okla. $661,200,000

Ore. $507,900,000



Pa. $1,865,800,000

R.I. $216,400,000

Utah $351,900,000

Vt. $201,200,000

Va. $718,400,000

Wash. $582,000,000

Col. $518,300,000

Conn. $342,500,000

Del. $202,200,000

Fla. $608,400,000

Ga. $838,700,000

Idaho $364,300,000

Ill. $1,668,500,000

Ind. $872,100,000

Iowa $751,300,000

Kan. $683,300,000

Ky. $666,900,000

La. $588,500,000

Me. $284,400,000

Md. $418,700,000

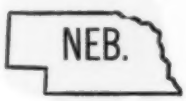
Mass. $735,700,000

Mich. $1,277,600,000

Miss. $574,000,000

Mo. $986,400,000

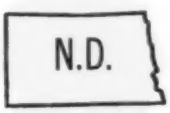
Mont. $539,000,000



Neb. $544,100,000

N.Y. $2,469,500,000

N.C. $903,500,000



N.D. $406,900,000

Ohio $1,509,300,000

S.C. $476,900,000

S.D. $427,700,000

Tenn. $766,800,000

Texas $2,112,500,000

W.Va. $418,200,000

Wisc. $822,600,000

Wyo. $369,900,000

D.C. $220,900,000

CATERPILLAR—
your partner in earthmoving progress—
has the equipment ready for the big job

The mighty D9, with 320 Turbocharged engine HP and No. 9S Loadshape Bulldozer, heads the line of six Caterpillar crawler Tractors. The other machines, with engine HP, are: D8—191 HP, D7—128 HP, D6—93 HP, D4—63 HP, and D2—48 HP.

The Turbocharged 300 HP DW21 with the 25 cu. yd. (heaped) capacity No. 470 LOWBOWL Scraper provides a fast, highly maneuverable earthmoving unit.

The No. 977 Traxcavator of 2¼ cu. yd. bucket capacity is the largest of the three Cat-built tractor-shovels. The No. 955 has a 1½ cu. yd. bucket; the No. 933, a 1 cu. yd. bucket. Lift forks and other attachments give added versatility to these highly productive units.

The No. 8 Ripper, for use with the D8 Tractor, is one of a line of five Cat-built tractor-mounted rippers. In addition to the No. 8, they are: the No. 9, the No. 6, the No. 4 and the No. 2 for use with other Caterpillar-built Tractors and Traxcavators.

The four-wheel DW20, with Turbocharged 300 HP Cat Engine, teams up with the LOWBOWL No. 456 Scraper (25 cu. yd. capacity) for high-speed earthmoving on longer hauls. The four-wheel 186 HP DW15 works with the No. 15 Scraper (12½ cu. yd. capacity).

Representative of the Cat four-wheel, crawler-drawn Scraper line is the No. 463. Heaped capacities are: No. 90, 27 cu. yd.; No. 463, 25 cu. yd.; No. 70, 15 cu. yd.; No. 60, 9 cu. yd.; and No. 40, 4.5 cu. yd.

Caterpillar Electric Sets are available in eight basic models ranging from 30 to 350 KW. Available in portable units, they are a reliable and convenient source of electric power.

Nine basic sizes, from 65 to 650 HP, make up the line of Caterpillar Diesel Engines. They are used by over 100 manufacturers to power excavators, compressors, crushers and other construction machines.

Heading the line of three Cat Motor Graders is the 115 HP No. 12. The No. 112 has 75 HP; the No. 212 has 50 HP.

N. J. GIRDS TO PUSH ROAD CONSTRUCTION

Highways Officials and Senators Confer on Possible One-Cent Gas Tax Rise

Trenton, June 29. The ex- | tion, according to state high- | a 90-10 basis for interstate
way program, | way officials here. New Jersey | roads, and one-third on a 50-50
will require over a billion dol- | basis to finance primary, sec
ondary and urban roads. Thi

41,000 Miles of Super-Highways New Federal Bill

Next year—and the years ahead—offer you the greatest challenge in the whole history of construction. The highway work alone will dwarf any previous undertaking.

Caterpillar has been preparing for this time. Plant capacity has been doubled and is still expanding. New and improved products are now in full production, giving you equipment designed and built to do more work, faster, at lower cost. When you bid on a contract, that kind of equipment can make the difference between profit and loss.

Caterpillar leadership is leadership *in action*. It never stands still. The full resources of Caterpillar research, both in the laboratory and right in the field with you, are constantly devoted to the development of even more efficient engines and earthmovers—equipment that keeps pace with your increasing opportunities.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar, Cat and Tractavator are Registered Trademarks of Caterpillar Tractor Co.

YOUR PARTNER IN EARTHMOVING PROGRESS

STATE TO GET $230 MILLION IN FEDERAL FUNDS BY 1959

Illinois Total Over $1½ Billion for 13-Year Highway Building Era

Washington, D. C., July 3. Estimates released by the U. S. Bureau of Public Roads call for $229,700,000 of Federal funds to be spent in Illinois in three years, starting July 1, 1956.

This represents 90 per cent of Interstate road construction costs. The state will furnish the additional 10 per cent. For the full 13-year period covered by the Federal Highway bill it is estimated Illinois will receive nearly $1,700,000,000.

41,000 MILES OF HIGHWAYS APPROVED BY PRESIDENT

Washington, D. C., June 29—You're going to get 41,000 miles of new four, six and eight lane highways in the next 13 years.

It became official today when President Eisenhower signed the Federal Interstate Highway bill. Under the new law, the Federal government will spend $32,900,000,000 through 1969 for the new roads.

The bill calls for a vast network of free superhighways linking most major cities and state capitals.

HIGHWAY BILL BOON TO UTAH ROAD SYSTEM

Salt Lake City, July 3—Over-all spending in Utah for highways in the next three years will rise from $25.2 million to $88.6 million. And for the succeeding 10-year period it will continue in the $75 to $95 million bracket.

This will result from the new 13-year road building program signed into law by President Eisenhower. By 1970 Utah will be criss-crossed by splendid four and six lane divided highways.

The state now has some 700 miles of interstate highways and the bill provides for a rebuilding of an amount equal to this mileage.

$32.9 Billion Highway Bill a Bargain for Car Owner

New Taxes on Gas, Tires to Cost Average Driver Only $8.60 per Year

Washington, D.C., July 2. The Federal Highway Aid bill, which has been high on the President's list of must legis- | It is a pay-as-you-go pro-
lation is now law. As high- | gram. But the $33 billion to-
pointed | tal, to be paid for by a 1-cent
increase in the gasoline tax, 3
cents a pound for tires and a
2 per cent rise in the price of
trucks, buses and trailers, will
result in safer, more economi-
cal driving. The average car
owner will pay only $8.60 a
year, and should save much
in fuel, time,

Poor Backfill Tamping Often Means Double-Cost Construction

By Edward F. Taylor
President, Gunderson-Taylor Machinery Co.

- **With modern mechanical tamping equipment now available, there is no excuse for failure at backfill locations.**

- **Bridge approach failures are a common occurance, due to lack of attention to the amount of compaction energy required, as well as to gradation and moisture control in the materials used.**

BACKFILL failures such as those illustrated on these pages should be as old fashioned as a horse-drawn fresno scraper. Yet each one of these failures occurred since 1953. It may be that such failures have become so commonplace that they are accepted as a necessary evil in modern highway construction. It is a rare culvert or bridge-abutment in a highway less than five years old that does not show signs of settlement in the areas of hand compaction.

Why should it be necessary to accept highway failures of this sort? Is it a lack of understanding about backfill compaction? Is it a general thought that such failures are an act of God? Is it the contractor's fault? Is it the fault of the inspection or the specifications? Is it because it is impossible to compact backfill by hand as well as by tractor drawn rollers? Or is it considered more economical to allow these failures to occur and then return after the contract is supposedly completed and reconstruct where the inadequacies become a public menace?

Mechanical or hand tamping, whether done pneumatically or by other methods, can in fact, come closer to perfection than can the compaction done by tractor drawn equipment. The degree of compaction is directly related to the amount of energy applied to each cubic foot of soil to be compacted. To obtain a satisfactory job of compaction — that will prevent settling — the engineer has but to assure himself that enough energy is applied to each cubic foot of soil which contains sufficient moisture that will allow efficient distribution of the energy throughout that soil (this is soil particle lubrication.)

It is no more logical to expect satisfactory compaction on a layer of earth which is two to three feet thick, too wet, or too dry, than to expect a farm tractor to effectively pull and

(Continued on page 70)

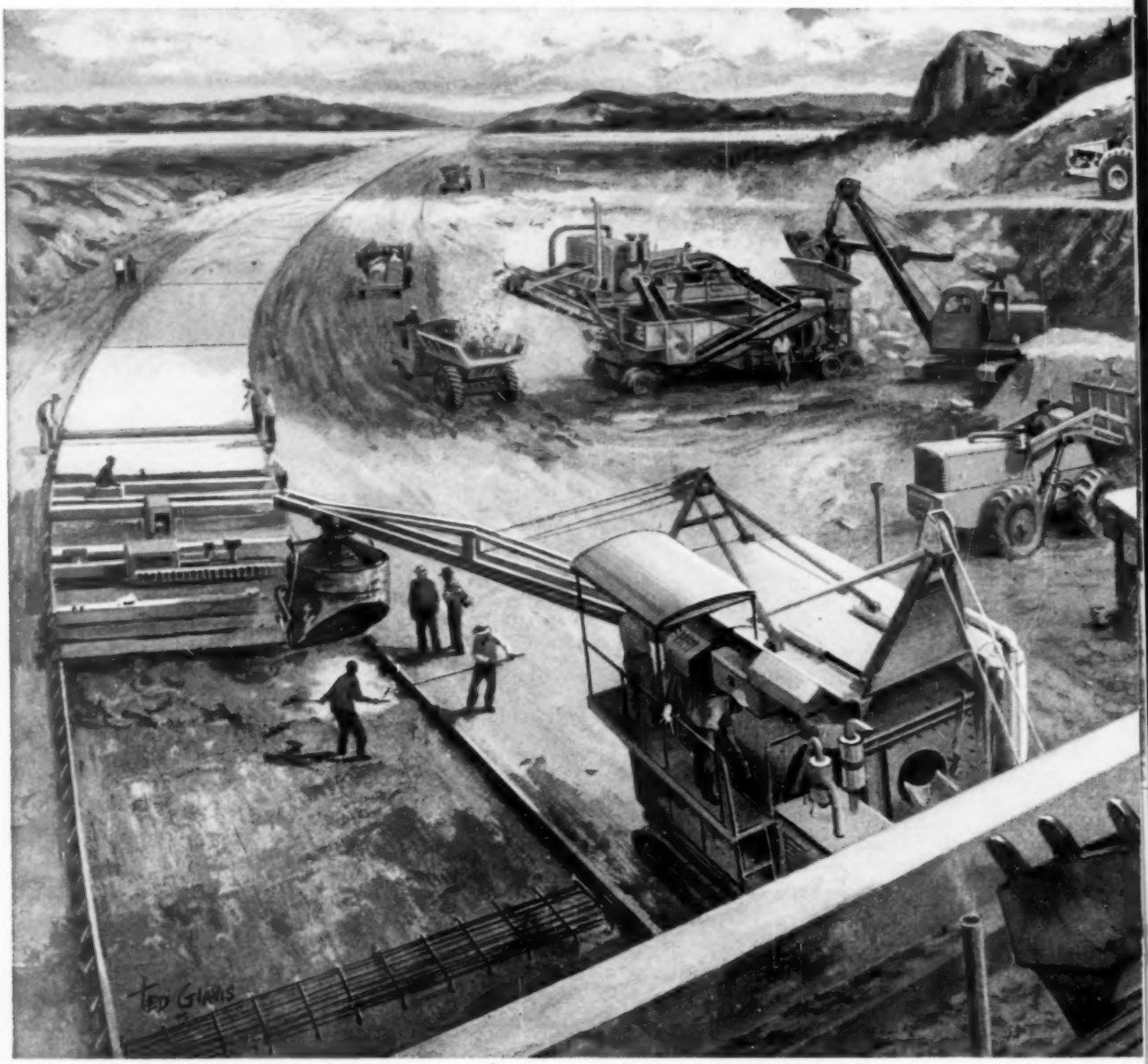
- **Trench settlement—failed pavement—disrupted traffic service. Who is to blame?**

amount equal to this mileage.

President's list of ... is now law. As high- ... pointed

owner will ... year, and should save ... in fuel, time,

What's the most versatile



It's GM—Choice of more than 150 equipment builders

General Motors Detroit Diesel engines power more different types of road-building equipment—built by more manufacturers—than any other Diesel.

These versatile two-cycle engines drive compressors, crushers, drills, pavers, graders, shovels and the world's most powerful off-highway vehicles.

Leading manufacturers install GM Detroit Diesel power in more than 1000 different machinery applications because it gives their customers unequaled work output and dependability, plus the backing of a world-wide service organization.

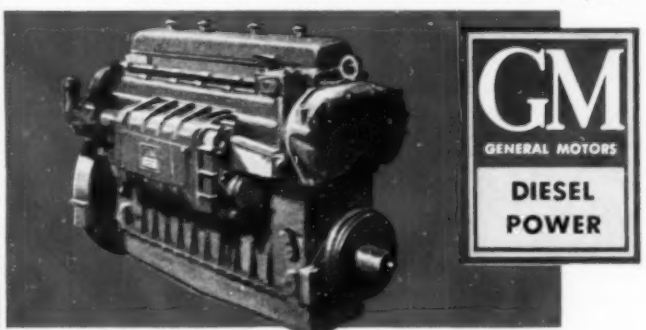
Contractor experience has proved GM Detroit Diesel power more efficient than either gasoline engines or other Diesels on almost every kind of job from 30 H.P. up. And Detroit Diesel's new Turbopower engines deliver even higher efficiency *—up to 17% more power on the same fuel, or the same work with fuel savings up to 15%!*

You're money ahead when you specify GM Detroit Diesel power in any equipment you build, buy or repower. It's America's First Choice Diesel *because it does more work at less cost!*

SEE OUR EXHIBIT AT THE ARBA ROAD SHOW, CHICAGO, JAN. 28 TO FEB. 2

Diesel in Road building ?

Equipment shown includes: Blaw-Knox MultiFoote paver and spreader; Koehring Dumptors; Cedarapids rock crusher; Link-Belt and Unit shovels; Ingersoll-Rand air compressor; LeTourneau-Westinghouse Tournapull and Pettibone Mulliken front-end loader. Write us for complete list of over 1000 GM Detroit Diesel power applications.



Single Engines...30 to 300 H.P. *Multiple Units...Up to 893 H.P.*

DETROIT DIESEL

Engine Division of General Motors
Detroit 28, Michigan

Regional Offices:
New York, Atlanta, Detroit, Chicago, Dallas, San Francisco

In Canada:
GENERAL MOTORS DIESEL LIMITED, London, Ontario

● Slip-out of embankment around culvert end — another type of failure that indicates poor compaction control as well as faulty design.

Poor backfill tamping

(Continued from page 67)

maneuver a fifty ton roller. Black-top or concrete settlement happens after the job is done. Inadequate compactive energy or poor soil conditions are not so obvious — until you hit the bump they cause. Then it's too late.

Numerous and extensive tests, with modern, efficient pneumatic tamping equipment, show costs from $.97 to $1.30 per cu. yd. But research also shows that highway departments, cities, and counties have paid as much as $4 to $7 per cu. yd. for backfill compaction, with the odious result that surface failures and the subsequent adjustment to safe surfacing, costs in excess of $10 per cu. yd.

Controlled laboratory tests and field work clearly show that for reasonably select material, 12,375 foot-pounds of energy are necessary to compact one cubic foot of earth to maximum standard density. It is likewise quite simple to obtain laboratory tests on the available backfill material so that optimum moisture can be made to exist through the addition of water by conventional methods.

Data Available

Simple but inclusive charts and data are available to anyone concerned at no charge. These charts indicate the basic properties necessary to construct a complete highway, so far as compactive materials are concerned.

Highway failures because of floods are more noticeable at culverts and bridge abutments because of backfill wash-out at these points. Inadequate densities from mechanical tamping has allowed the moisture to bypass the culvert of the bridge seeping through this slightly compacted fill, it finally washes the road away, so that when the flood waters recede, though the bridge or culvert may be in place, there is no road leading up to them.

Apply sufficient energy to each cubic foot of earth and maximum practical density will be achieved. The proper selection of backfill material with optimum moisture then — and in combination with good compaction — will create the necessary stability. The selection of compaction equipment that will impart this energy to each cubic foot of earth in the least time and the lowest cost is simple, *because the equipment is available everywhere.*

The 4" to 6" lifts for mechanical compaction exist only because highway construction officials assume that inspectors as well as contractors will exceed the lifts specified to such an extent as to prevent the needed minimum compaction energy to penetrate these greater lifts.

Areas of Understanding

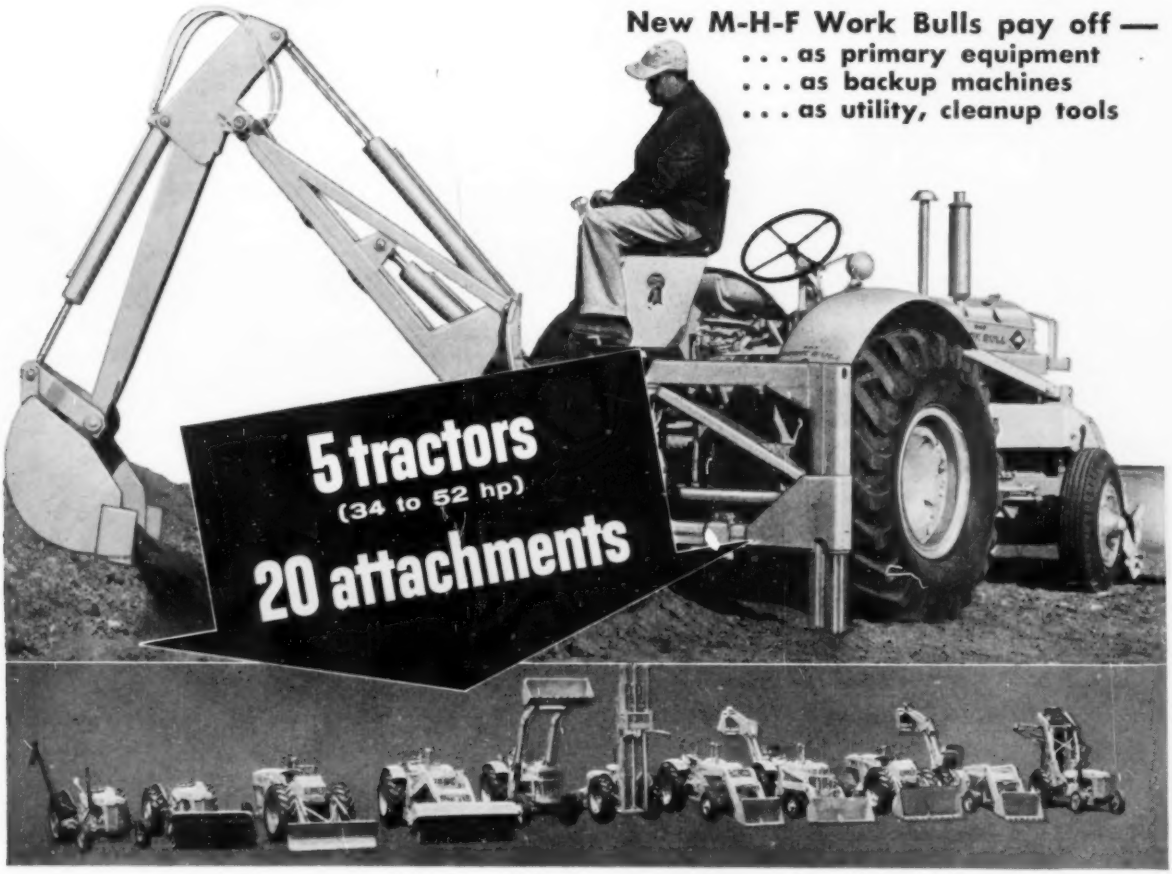
It then remains to achieve an area of understanding between the highway department engineer and the contractor. First it appears necessary that the highway department engineer recognize the enormous importance of backfill compaction and give it high quality careful engineering inspection during the process of backfill work. The contractor must realize that the proper selection of adequate equipment as well as its use can be of as much a profit to him for this section of the work as for any other section. If hand backfill compaction is specified realistically and the contractor takes a practical stand as to its ease to accomplish a job — then and only then will a "complete highway" be constructed.

We'll See You at the Big Chicago Show

— WHERE OLD FRIENDS MEET —

Versatile, power-matched packages!

New M-H-F Work Bulls pay off —
. . . as primary equipment
. . . as backup machines
. . . as utility, cleanup tools



Versatile Work Bulls — with *switch-in-a-smoke-break* attachments to dig, doze, load, lift and handle scores of other jobs — offer a great new profit opportunity!

On small, scattered jobs, Work Bulls mechanize hand labor . . . simplify handling work-and-run assignments.

On medium-sized layouts, Work Bulls team with larger machines — provide the power/equipment cost-ratio the job requires.

On big spreads, Work Bulls relieve expensive scrapers, dozers and shovels of unprofitable utility and cleanup duties.

What's more, with Work Bulls you have one source, a single responsibility for sales and service on both tractors and attachments. Write for free catalog and the name of your retail distributor.

TRACTORS, ATTACHMENTS — DESIGNED FOR EACH OTHER! Representative machines in the first line of light and medium-duty wheeled tractors to be built to construction standards. Cost of tractor with variety of attachments is below that of medium-priced, single-purpose machines.

42-HP DAVIS PIT BULL handles either ⅝ or ¾-yd buckets . . . frequently out-performs bigger, more costly shovel-loaders. Torque converter and "foot-shift" reversing clutches allow operator to change direction without pausing to shift.

MODEL 202 FORK LIFT loads equipment and machinery, stockpiles building materials, also handles blade or utility bucket.

52-HP WORK BULL MODEL 404, with ⅝-yd loader, pays off on scores of backfilling, loading and stockpiling jobs.

M-H-F
WORK BULLS
DIVISION OF MASSEY-HARRIS-FERGUSON, INC.

20-L **Quality Avenue** **Racine, Wisconsin**

. . . for more details circle 276, page 16

Why nothing but Asphaltic construction would do for this new approach to the Golden Gate Bridge...

According to the State of California's own averages . . . the savings effected by using Asphaltic Concrete on the new Waldo Grade Project were $78,564 per mile. Or . . . $290,115 for the 3.68-mile job. A whopping big 43.8% saving!

The difficult job of repaving and widening the Waldo Grade on U. S. 101 is completed. And traffic is now rolling on wide ribbons of velvet smoothness.

Asphalt construction was picked for many reasons. The traditional ones, of course. First low cost. Fast working characteristics. Durability. Smooth riding. Skid-resistance. Economical maintenance.

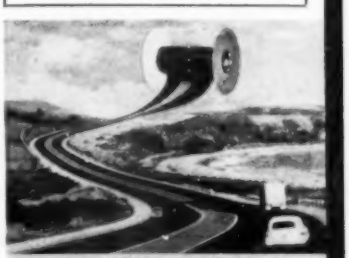
But there was another important consideration, too. The added width of this project had to be constructed in steep, hilly terrain. Nearly all fills were the side fill variety. Thus, it was *anticipated* that some settlement would occur at the junction of the new fill and the original ground.

Cracking *did* occur in the dense graded mix. Cracking that would have proved costly, time-consuming . . . if not an insurmountable handicap . . . for any other paving material but Asphalt.

With Asphalt construction, however, the cracking was filled . . . the wearing course laid . . . and smooth riding assured for generations.

WILLIAM A. RUSSELL

The paving of this outstanding Waldo Grade job was done by the A. G. Raisch Company . . . under the supervision of "Bill" Russell. Mr. Russell writes: *"I have used Asphalt construction for 25 years. I firmly believe that Asphalt can provide the finest surface anywhere it is placed."*



Ribbons of velvet smoothness . . .
MODERN **ASPHALT** HIGHWAYS

THE ASPHALT INSTITUTE, Asphalt Institute Building, College Park, Maryland

. . for more details circle 181, page 16

By Geo. E. Deatherage, PE
Construction Consultant

Mr. Deatherage, author of this series on highway cost-keeping, has developed an 8-volume "Manual of Advanced Construction Management" for readers who are interested in more details of cost-keeping and the many related subjects in highway contracting business management. Please address your inquiry to George E. Deatherage and Son, P. O. Box 921, Lake Worth, Florida. Many contractors are finding this manual useful in a training course for superintendents and project managers. It is written primarily for these supervisory employees as an aid in better equipping them for taking on larger responsibilities and improving their management techniques.

V Application of Industrial Engineering Techniques

Simple Process Charts

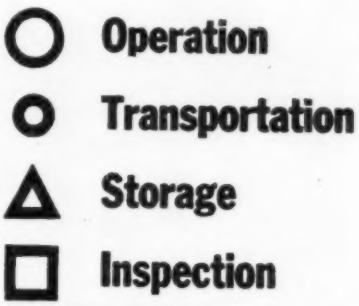
It hardly seems necessary to point out that, before an estimator can figure a unit price or cost, he must first determine the method to be used in performing the work. What men and machines, separately or in combination, are to be used, and what estimated production is to be secured by their use? It follows necessarily that there are several alternate possibilities. The problem is to select the one best method out of several.

Currently and traditionally in the construction business, the practice is that the estimator forms a mental picture of what is to be done and, using his best judgement, with or without the advice of others, determines the method which (in his opinion) is best for that purpose. It is to be emphasized that this is, in the main, purely a mental process of method selection, rarely put down on paper and subjected to a detailed analysis as compared to other possible alternates.

This type of work methods selection may be termed purely "snap judgement", and may be in error, either in part or as a whole. It is not subject to detailed mathematical analysis to prove or disprove it correctness. This has a good deal to do with the fact that since 1945, contractor failures have been continuously on the increase and the average age of firms in the construction business is not much over 3 years old and that at least 40% of new construction firms fail to survive 2 years.

The above amazing figures for the industry as a whole certainly points to the fact that, in order to correct this condition, there is need for a radical change. The first thing needed is the elimination as far as possible, of "guess work" in estimating. The construction industry must remove itself from the pinnacle of exceptionalism which it has consistently maintained, as to the adoption of the industrial engineering techniques which are the backbone of the manufacturing and process industries.

Fortunately, over the years, the industrial engineering profession has developed very simple but scientifically accurate methods of locating unerringly, and evaluating exactly, what is wrong with any production process, and also methods of pre-determining the one best method. To substitute for the nebulous mental image of what is to be done, and how to do it best . . . a picture or image is created on paper which can be subjected to detailed mathematical check and analysis. Guess work for all practical results is eliminated or at least reduced to a minimum.



PROCESS CHART uses a sign language made up of 4 simple symbols.

• Symbols which will simplify the work of describing process steps.

• It will be the purpose of this article, and several to follow, to introduce the estimator to the technique of "Work Process Charts" as a means of "methods pre-planning." This technique is in use in but a handful of contracting organizations, but is gradually spreading. We will start with the most simple type of "Process Chart" and progress in future articles in this series to "Process Gang Charts," "Gang and Material Charts," etc., which, although sounding complex, are in reality very simple.

It is well to keep in mind that on construction work fully 85% of all labor is expended in transporting materials and but 15% or less in frabicating or changing their shape.

Referring to Fig. 1, it is to be noted that the chart is built up around a simple type of shorthand which is used to identify the nature and extent of what is being done, or planned to be done, on each step of the specific work in hand.

The large circle indicates the "operations" in the process of performing the work, such as piling lumber, sawing lumber etc. If the operation changes the shape of the material to be used on permanent construction, such as "sawing lumber", the circle may be filled in solid. Piling lumber does not so change it, so it is left open.

The small circle indicates a "transportation", or the movement of men or materials from one place to another, except that if the material is within reach of the workman the movement is considered part of the "operation". These latter movements fall, as we shall see later, under the category of "Time and Motion Study" . . . which charts the movement of either hand in performing a task.

The "triangle" indicates a storage (temporary stoppage) or delay. A loaded truck in the process of being unloaded is not delay on the part of the truck and driver. However, if it is awaiting unloading, it is then a delay in the proper sense.

The "square" indicates an "inspection" or "approval", for quantity or quality or to secure information. For instance, reading an order is an "inspection" as is also the act of a foreman or inspector in the process of inspecting work being done . . . measuring, counting, grading, etc.

● In its simplest form, as in Fig. 1, the work to be done or being done (proposed or present) is stated under "subject charted" and then broken down into its various "steps", in the proper sequence, under "process description" . . . wherein it is identified and measured through use of the symbol applying. At the same time there is posted, under its respective column on the left hand side of the sheet, the distance men or materials move (if moved) and the time taken for either the transportation, operation, storage or inspection.

Chart Indications

If the charting is indicated in the little square at the top of the sheet as "proposed", the recording of the proposed events under "process description" is a step-by-step posting, in the assumed sequence, of things to be done; such as in mixing concrete. As each step thought necessary is posted (such as wheeling aggregate to hopper), the time to do this and the distance materials move are posted. With the chart completed we now have all the proposed steps necessary to do a specific piece of work set down and measured.

These are the basis of calculating the unit costs for the work and quantity involved.

It is readily seen that this same "step-by-step" process description may be recorded from work actually being done in the field, the time taken, and the distance materials or men or equipment move checked . . . in which case the chart is ticked off in the proper square at the top of the sheet as "present".

● As construction is concerned with work done by men and/or machines with the use of materials, it is vital that, as far as possible, we should elect to chart either or the other. That is, if the prime purpose is to follow or chart the labor, then the plotting under "process description" should follow that only. If the idea is to follow more specifically the machine or the materials, the plotting should hold to that selected. Confusion will result if these various things are mixed up on the same chart. In other words, keep your eye on the ball and do not be side-tracked into charting other than the one item selected . . . and record *every* step in the process.

As previously stated, the use of these simple charts such as Fig. 1 are limited to functions or parts of a process. We have no columns for entering rates of men or equipment, particularly if there are more than one involved, and to arrive at actual costs per step and/or the total cost. This will be covered in a later article under "gang charts".

What then are we accomplishing in the use of this simple chart?

When it is subjected to a detailed analysis, it will show up unnecessary handling, excessive movement of materials, duplication of effort, man-hour inefficiencies, excessive number of steps in the process, etc. A guide to such an analysis follows:

1. What is done? What is the purpose of the step or operation?

Coming SOON

A NEW Profit-Maker FROM

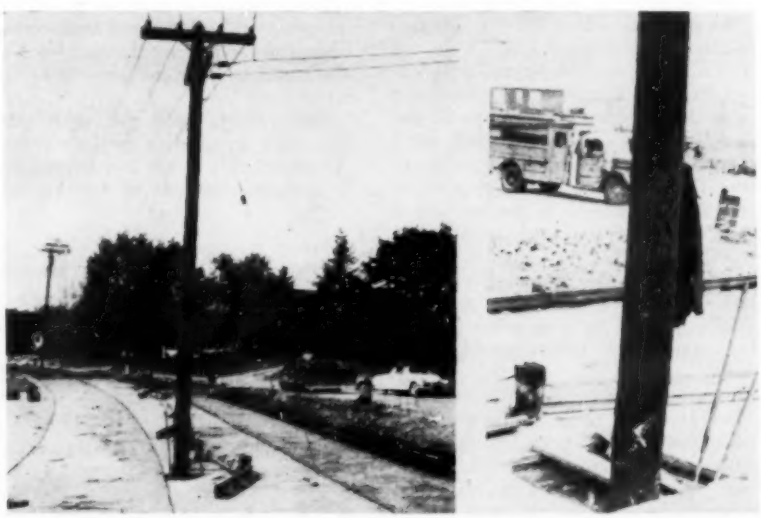
BUCYRUS ERIE

196E56-a

Watch for it!

. . . for more details circle 274, page 16

Some Coordination! Pictures Worth 1,000 Words



● **Road and street contractors who are held up by lag in right-of-way acquisition, utility relocation and other delays will chuckle at these scenes, taken near Cincinnati. Here the contractor didn't wait but placed concrete paving around poles in building a section of county highway on new location. The poles of course will come out and the resulting holes patched, it is hoped. (United Press Telephoto).**

2. Why is the work done? What would happen if all or any part of it is not done at all? Is every step or operation necessary?

3. Why does it take so long to do it? Can the time taken on any step be reduced?

4. Who does the work? Who could do it better? Can changes be made to permit a person with less training and skill or a more efficient machine to do the work?

5. Where is the work done? Could it be done somewhere else more economically?

6. When is the work done? Would it better to do it some other time?

7. How is the work done? This suggests the use of machine rather than hand methods or the substitution of another type of machine.

These are only part of the possible questions one might ask about each recorded step in the work process in order to reduce them to a minimum . . . and arrive at the most simple "paper picture" of the method.

Now consider the following:

A. Why do the work at all?

B. Eliminate unnecessary work; steps and operations, transportations, delays and storages etc.

C. Combine any of these steps or operations.

D. Change their sequence.

E. Simplify the necessary steps or operations.

"One Best Method"

The next and final step is to prepare a comparative chart of an alternate method, or a refinement of the present one, wherein all unnecessary steps are eliminated, operations combined, steps simplified, distances materials moved reduced, etc. This should result in a concrete reduction in the number of steps, operations, transportations, delays and inspections . . . the work process being reduced to its lowest terms . . . and the one best method predetermined. As many charts should be prepared as there are alternate methods, assuming that each one improves on the one before to reduce the number of things, distances and times . . . until no further progress can seemingly be made.

• Once we have arrived at the "one best method" the problem is to convert the data into money values. What does each "step", "operation", "delay" or "inspection" cost? We can determine this with this simple chart if we are dealing with only one man whose hourly rate is known, for we have the time taken for each symboled entry.

(Continued on page 77)

The Perfect Seal

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PERFECT BECAUSE . . .

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. . . for more details circle 268, page 16

Allis-Chalmers HD-16 Crawler Tractor and 315 Scraper—

BIG-CAPACITY DIRT-MOVING TEAM

Allis-Chalmers HD-16 and 315 scraper team gives top dirt-moving production.

With over 16 tons of balanced weight, plus long-life, ground-gripping tracks to take advantage of the heavy-duty power plant — the HD-16 has the capacity for big loads and fast work cycles on scraper operations. Simplified lubrication and maintenance procedures add valuable working time to daily schedules.

In addition, the HD-16 is available either with the 6-speed standard transmission and 141 belt hp, or with job-proved hydraulic torque converter drive and 150 net engine hp to meet your work requirements.

The 20-cu-yd, cable-controlled 315 scraper features a low bowl with curved bottom and offset cutting edge — the most effective design for boiling dirt into the bowl It gives a live load throughout the loading operation — reduces load resistance to get full capacity fast, with a minimum of tractor effort.

And you get extra advantages with this Allis-Chalmers 315 scraper: correct distribution of loaded weight for easier hauling and longer tire life . . . apron is hinged to ejector instead of to scraper sides, moves forward and upward during spreading for faster, cleaner unloading . . . long, wide pusher block is positioned to protect scraper tires and to deliver in-line push for maximum power to the scraper cutting edge for instant penetration, fast loading.

Check heaps and cycles on your jobs soon. Arrange to see the team designed with BIG production in mind — the Allis-Chalmers HD-16 crawler tractor and 315 scraper.

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FOR A DEMONSTRATION . . . SOON!

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. . . for more details circle 270, page 16

Geo. E. Deatherage & Son, Inc.
INDUSTRIAL ENGINEERS

PROCESS CHART

☐ - PRESENT
☑ - PROPOSED

SUBJECT CHARTED: Bridge Superstructure, Sta. #27 Cont. #618
OPERATION: Place concrete by pipe line model #200
DEPARTMENT: Concrete/Supt. James

DATE: 10/3/56
CHART BY: R. L. M.
CHART No.: 22
SHEET No.: 1 OF 1

DIST. IN FEET	TIME IN MINS.	CHART SYMBOLS	PROCESS DESCRIPTION
	200	60	Make ready. Hoppers, vibrators & tools.
	150	15	Move above to job site.
	2 Mi.	45	Transport pump machine to job.
		90	Set up pump machine & pipe, etc.
		30	Foreman check & approve setup.
		30	Make final equipment adjustment.
		20	Waiting on Ready-Mix delivery.
	115	360	Pump concrete to deck forms.
		80	Delay time - based on 50 min. hr. working time.
		45	Dismantle plant - & cleanup.
	150	15	Vibrators & tools to shed.
	2 Mi.	30	Pump mach. & fittings returned.
	150	15	Foreman - final inspection.
		10	Final cleanup.
			Crew to check out station.
			Totals
			Operations - 6
			Transportations - 5
			Delays - 2
			Inspections - 2

● **Figure 1. Office form for use in describing and tabulating the various processing steps, as a preliminary for estimating costs.**

Or we could do the same if we had only one machine whose total hourly ownership/operating rate were known. However, in most cases we will wish to deal with several men or a gang, plus a machine or two; all at different hourly rates and performing different steps in the process simultaneously. It is possible to secure this data through the use of a special process chart known as a "gang chart" and which we will present an article to follow.

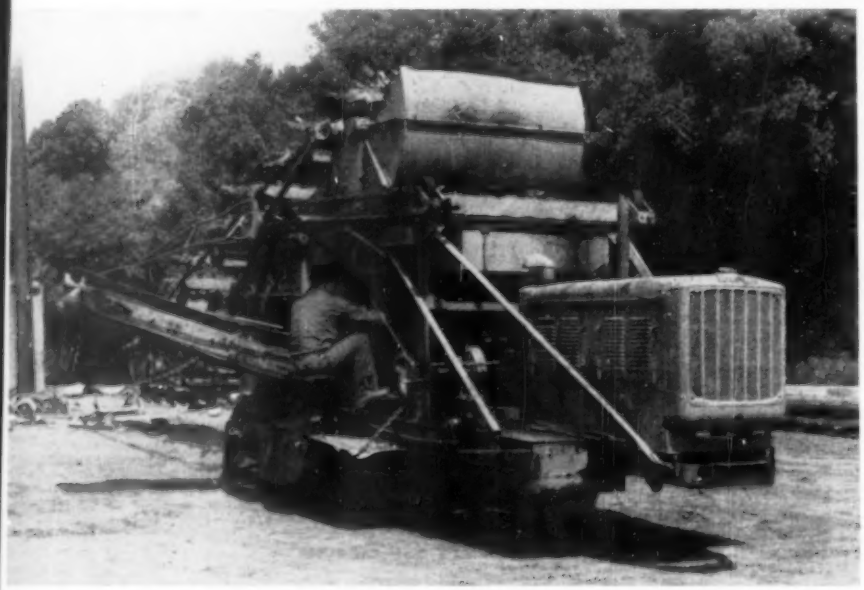
The simple chart presented herein is through the courtesy of "Work Methods Manual" by Ralph M. Barnes (John Wiley & Sons). Although not written for the construction industry, this little book of 136 pages will quickly inform those interested as to the basic principles of "Work Simplification" methods and procedures, upon which their application to the construction industry is based.

Job and Equipment Ideas

Ditcher adapted to wide sewer trench

Pictured here is a Buckeye Model 160 ditcher which has been modified for use in cutting an extra width storm drain trench. Belonging to McGuire & Hester, subcontractors on Mountain Boulevard Freeway project in Oakland, California, this ditcher has 56 in. buckets in place of the standard 30 in. buckets.

More novel, however, is the installation of a Caterpillar D318 diesel engine on the rear of the machine, to provide the extra horsepower needed for the wide ditch cut.



● Modified Buckeye 160 ditcher used by McGuire & Hester on a California road project.

● Shovel rack helps keep track of tools and keeps them off the ground.

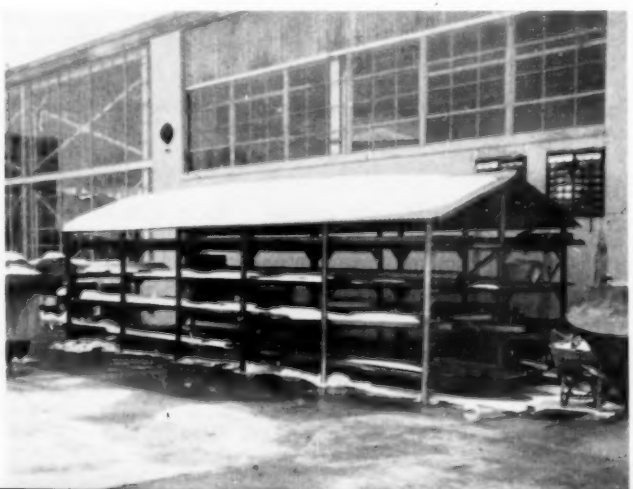
Portable shovel rack

Where it is found that tools become lost, strayed or stolen easily, a simple check is to build a stand for them and then check occasionally if any are missing. The stand will also keep the shovels off the ground, and from under the wheels of trucks and the feet of men.

The rack was made by simply taking a flat piece of steel and welding a reinforcement of angle iron on each side and a 2-inch pipe as a post. Into the post is screwed a nipple which carries a rack made by splitting an 18-inch nipple and welding each side to the upright as shown. The shovels can then easily be slid back into the slot and the rig can be set on the tool truck for easy moving.

Racks Help Keep Shop Surroundings Orderly

Pictured here is a rack for storing small hand tools—one of many features in the modern headquarters shop of Denton Construction Co., of Detroit, Mich. The rack is located on the shop's spacious balcony or "mezzanine". At right is another Denton idea, a rack for storing steel bars, rods and other shapes. This is located immediately alongside the shop wall, the corrugated roof being ample weather protection.



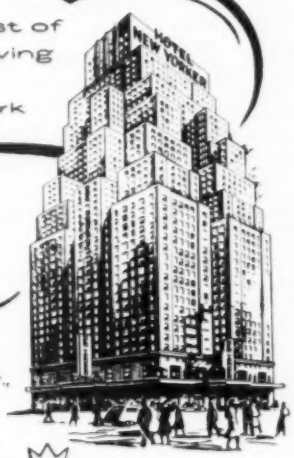
Compaction results vs. roller pressures

"Effect on Soil Compaction of the Tire Pressure and Number of Coverages of Rubber-Tired Rollers and Foot-Contact Pressure of Sheepsfoot Rollers." Report No. 7, U. S. Waterways Experiment Station, Corps of Engineers, Vicksburg, Miss. Presents results of a study on a lean-clay soil. Test fills were built with a rubber-tired roller (50 to 150 psi, 4 to 16 coverages) and a sheepsfoot roller (14-sq-in. feet, 125 and 375 psi).

Increasing the coverages or tire pressure of a rubber-tired roller, resulted in higher maximum densities at lower optimum water contents. Increase in density resulted in (a) higher strength where the soil water content was under optimum for the highest compaction effort used, and (b) lower strength where under optimum. Increasing foot pressure on the sheepsfoot had little effect on the degree of compaction or strength obtained in the test soil.

The Crest of Good Living comes to New York

The New Yorker



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DAVIS LOADER AND BACK-HOE FORM CRADLE AROUND TRACTOR

Even though the Davis Back-hoe uncouples in minutes, it fits as rigidly to the Davis Loader as if it were welded on. The two units form a sturdy frame that "cradles" the tractor, absorbing stress and strain when digging or going over rough terrain.

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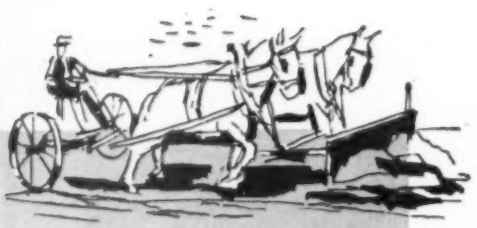
TOWN.....STATE.....

... for more details circle 240, page 16



Times change • Needs change

Success goes to those methods to meet

Big jobs ahead call for a review of your equipment inventory . . . a careful review of your earthmoving methods. Some of us old timers go back to the days of team-and-scraper, team - and - wagon, wheel - and - float steam-shovel on earthmoving, with the Fresno and split-log drag for leveling and maintenance.

Then the work dimensions changed and our equipment changed to meet them. Shovels shed their steel wheels, rolled on crawlers. Steam went out and gasoline came in. Trucks replaced wagons . . . tractors, new on the farm, shed wheels for tracks, and tried for a place on the roads.

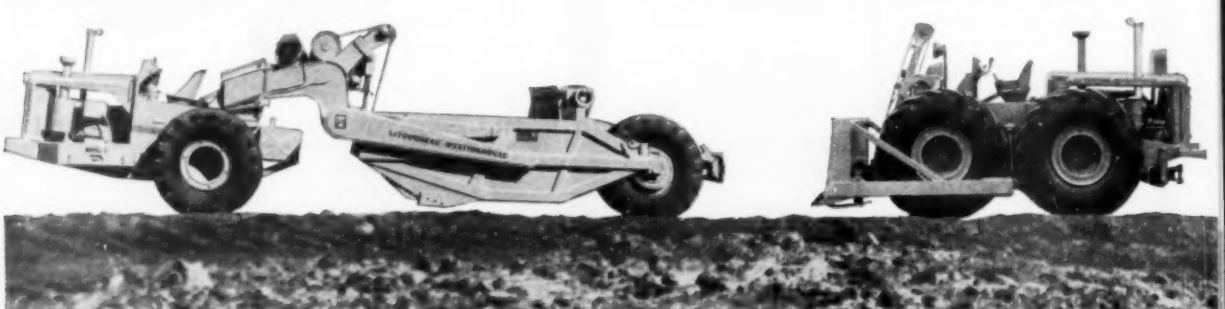
Load-haul-spread tractor-drawn wheel scrapers took over most of the short-haul production earthmoving. Dynamite replaced black-powder, jack-hammers replaced sledge-hammers and hand-drills. Leaning wheels revolutionized the application range of the early graders.

As job dimensions changed earthmoving machines made further changes. Diesel engines replaced use of gasoline. Rubber-tired prime-movers hauled dirt faster and farther. Off-road rubber-tired haulers replaced most of the highway-type dump-trucks. More power and bigger capacity gave answers to larger projects, shorter hours, higher wage rates.

Now we can see more changes in our problems of today and tomorrow. Answers we found in the power and traction dimensions, together with bigger buckets and bodies, no longer can meet all the needs we face. We must work in the other dimensions

TOURNAPULL-SCRAPERS—138, 208, and 293 hp models heap 7.5, 18, and 25 cu. yds. fast . . . work and travel on or off-highway at speeds to 29.9 mph. Electric power-steer turns prime-mover 90° . . . rigs make 180° turns in area narrower than machine's length. Power-transfer differential applies traction to wheel on firmest footing.

TOURNATRACTORS—208 hp Model "C" with 24,700 lbs. pull at 1.5 mph . . . works and travels on or off roads, to 17 mph fwd., 7 mph rev. Giant 416 hp TWIN-C TRACTOR, with 65,900 lbs. drawbar pull, loads biggest scrapers easily . . . has power king-pin steer . . . travels at 20 mph, rev. to 5.8 mph. Both have torque converter.



Flexibility for added utility. TOURNAPULL prime-movers earn year-round profits with interchangeable trail-units: scraper, rear-dump, bottom-dump, side-dump, flat-bed hauler, lift-and-carry crane, and logging arch. Model "D" has added utility with bulldozer and V-type snow plow attachments. TOURNATRACTOR Model C may be equipped with bulldozer, Angle-dozer, push-block, root-rake, railroad car-coupling, winch, side-boom crane, tree stinger, and V-type snow plow and wing. Also pulls wheeled scraper, sheepsfoot-roller, Rooter, and other types drawbar equipment. ADAMS GRADERS available with Elegrader, scarifier, bulldozer, snow plow and wing, rotary snow plow, and snow-blo attachments.

who can anticipate and change today's and tomorrow's needs

of speed and mobility if we are to meet this new and growing challenge of more and more yards to move, longer hauls with greater variables in unit length and quantity, shorter time limits, short labor-supply at even higher wage-levels.

For over twenty years LeTourneau-Westinghouse has been working toward the only possible answers. This was to give you new types of equipment on rubber to increase your performance ability in these dimensions of speed and mobility.

The problem of applying speed and mobility to heavy off-road dirtmoving equipment presented some very difficult engineering problems. Over their 20 years of field experience and improvement, we believe they have found and perfected some real answers to these problems and, today, can give you most for your money in dependable rubber-tired equipment performance applied to the four dimensions of 1. power, 2. traction, 3. speed, and 4. mobility.

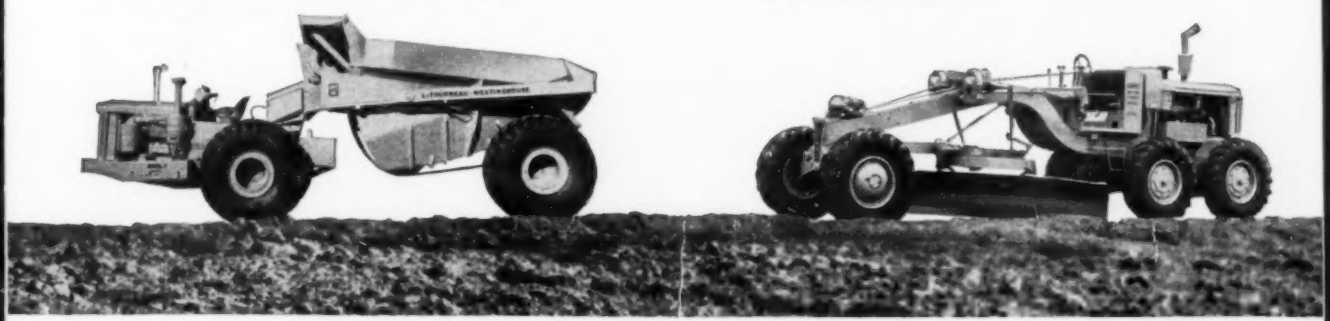
As you equip for the tremendous growth in earthmoving ahead, be sure to study carefully the improved line of LeTourneau-Westinghouse self-propelled scrapers . . . rear-dumps . . . tractors . . . and graders. Every one of these machines is a better machine than we offered last year or in the years before. Every one of them offers big advantages in speed and mobility that will be more and more important to you in solving all the problems involved in the bigger and bigger earthmoving projects ahead of us.

May we suggest that you call us today and ask us to help you check your present equipment inventory and recommend a planned program of replacement and additions to meet your needs for the future. Then take time to see these up-to-date LeTourneau-Westinghouse machines perform on your own job *or on jobs like yours.*

We would also like to suggest that you plan to order well ahead of required delivery. The best equipment for you is best for others, too, and, in spite of a tremendous increase in manufacturing facilities, LeTourneau-Westinghouse is having difficulty keeping up with demands from customers who have already proved the importance and value of greater speed and mobility on their own jobs.

REAR-DUMPS—11, 22, and 35-ton haulers powered by 138, 208, and 293 hp Tournapull prime-movers, haul on or off-highway to 34.4 mph. 90° turn-ability permits 180° turns loaded, in space narrower than machine's length . . . in ¾ of length with dump-body raised. These units dump clear over bank, pull out with front-wheel drive.

ADAMS GRADERS—Heavy-duty models, 20,900 to 27,730 lbs.; 80, 104, 123, 150 hp . . . have 8 fwd. speeds to 26 mph, 4 rev. to 13 mph, and 3 optional creeper speeds. Utility grader, 60 hp, 14,865 lbs., 18.3 mph; 5 fwd., 1 rev., 4 optional creeper speeds. TRAVELOADER, to 26 mph, loads 600 yds./hr.



Adams, Rooter—Trademark, Tournapull, Tournatractor, Angledozer—Trademark Reg. U.S. Pat. Off. G-1102-H

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A Subsidiary of Westinghouse Air Brake Company

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See you at the ROAD SHOW • Chicago .. • January 28-February 2, 1957

. . . for more details circle 226, page 16

● Superelevation and torsional stresses were complicating factors in the structural design.

Kentucky Builds Long Continuous Concrete Box Girder Bridge

By E. D. Smith

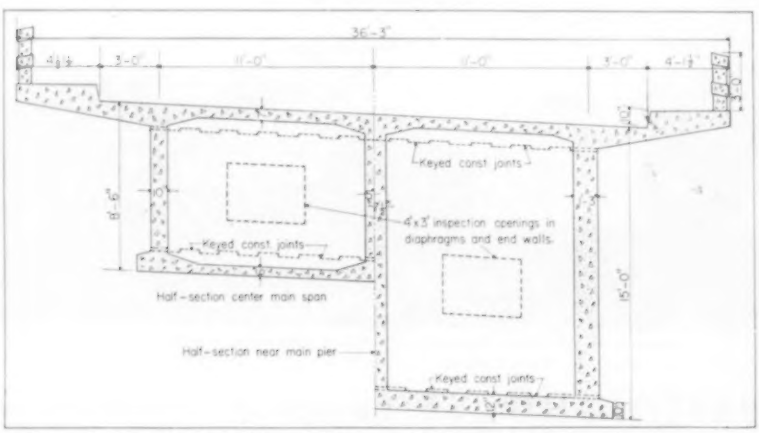
Director, Division of Bridges, Kentucky Department of Highways
Frankfort, Kentucky

Provisions made to adjust and check camber at intervals over period of years. Structure considered example of the efficiency and architectural simplicity inherent in this type of design.

A CONCRETE box-girder bridge, with main span of 200 ft. was built over the Kentucky River on U. S. 68, ten miles south of Lexington, Kentucky. The structure replaces an old iron bridge which failed under traffic in 1953.

Soon after failure of the old bridge, the Kentucky department of highways erected a 3-180 ft. span, double-bailey bridge, having a live load capacity of one 8-ton truck, to serve as a temporary structure.

Early in 1954 Army approval was received for spanning this navigable stream. On August 13 of that year bids were received for the construction of the hollow-box-girder bridge, and the contract was awarded to the low bidder, Harry O. Wyse, contractor of Lexington, Kentucky. The contractor was allowed 400 calendar days for the work. The bridge was opened to traffic on November 28, 1955.


Keyed const joints
4'x3' inspection openings in diaphragms and end walls
Keyed const joints
Half-section center main span
Half-section near main pier
Keyed const joints

● Figure 1. Cross-sections of box girders at main piers and at center of main span.

The abutments are supported by battered steel pile bents driven to rock. All pier footings are founded on good hard lime rock about 21 ft. below normal river pool. The usual steel sheet pile cofferdams were employed for construction of piers and no difficulties were encountered.

The bridge was designed for H 20-S loading, in accordance with AASHO Specifications (1953), and has a 28-ft. clear roadway and two 3-ft. sidewalks. The hollow-box-girder structure includes two 70-ft. simple spans and a continuous unit (140′-200′-140′ spans).

The two 70-ft. spans and one 140-ft. span are built on a 20-degree horizontal curve, which complicated the construction. Because of the curve it was necessary to calculate the stresses (both shear and moment) due to torque. The structure is also built on a vertical curve and is super-elevated ½ in. per ft. maximum.

The box girders have a depth of 15 ft. at main piers and 8½ ft. at

center of main span (Fig. 1). Transverse diaphragms with 7-in. thickness and having 3 by 4 ft. inspection openings were placed at about 25-ft. centers. The web beams vary uniformly in thickness, with minimum of 10 in. and maximum of 15 in. near the supports.

Manhole covers are provided for each cell at center of main span, and steel frames are covered with copper screen provided at end walls over all piers, so the cells can be inspected for the entire length of structure. The cells are provided with drains having copper screens.

Navigation Lights

Conduits and cables for navigation lights are located in the cells. Suitable steel ladders for servicing the navigation lights are attached to the outside of handrails and box girders. A Sunswitch located near one end of the bridge controls the navigation lights. Control is by a sensitive photoelectric circuit that operates according to the foot-candle valve of daylight.

It was necessary either to use a lap splice or weld the long longitudinal bars, since the longest stock bar available was 60 ft. There was not sufficient space between some of the bars to obtain good bond with lap splices; hence the bar ends were V-cut on each side and butt-welded. It was necessary to place some of the bars in the bottom slab in bundles of three. The contractor made several preliminary welds and some were tested, to determine if proper welding techniques were being employed. After all the welds in one span had been made, samples

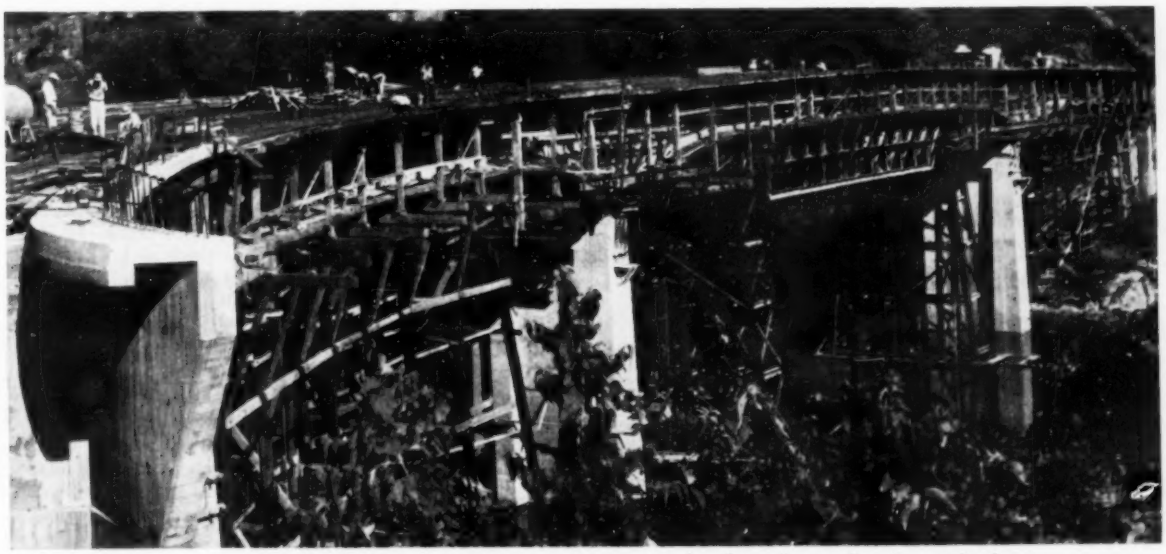
● The New. Kentucky's largest continuous concrete box girder bridge, opened in November, 1955.

New Bridge Replaces a Real Old Timer

The old wrought iron Pratt truss bridge (Fig. 4) which this new bridge replaces, was built in 1869-1871, and consisted of three 180 ft. spans with 18-ft. roadway, 20-ft. vertical clearance, and timber floor. The abutments and piers were made of good stone masonry. The Lexington, Harrodsburg and Perryville Turnpike Company was authorized by the Kentucky Legislature, March 5, 1869, to build this first Kentucky toll bridge.

The truss top chord consists of four 8-in. I-beams bolted together with ¾-in. bolts at 5-ft. centers. The end posts were fluted hollow sections, the intermediate posts were I-beams, the diagonals were round rods and the bottom chords were flat bars.

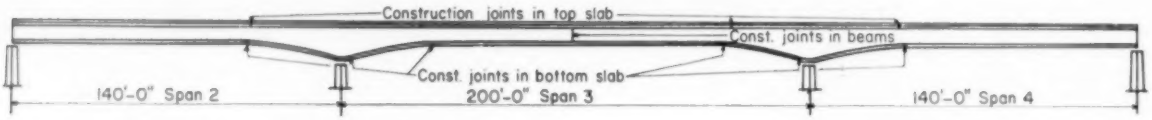
At the bottom chord panel points, the members were held together by two castings. And four ¾-in. bolts used for each set of castings. The iron used in this old bridge probably came from England.



● Falsework in place for entire bridge. 88-ft. horizontal opening was required under main span for river navigation.

● The Old. Kentucky's first toll bridge, built in 1869-71, failed under traffic in 1953.

● A three-180 ft. span, double-duty bailey bridge served during the interim between failure of the old bridge and opening of the new.



● Figure 2. Location of construction joints for bottom slab, vertical walls, and top slab of the continuous unit.

were selected at random, and tests made by the Highway Materials Testing laboratory, J. A. Bitterman, director.

After all falsework had been removed, 3-ft. concrete handrails were built in sections approximately 10 ft. long, with clear openings of ¾ in. to 2 in. between sections. Some of the rails were built on a curve to match parts of the bridge built on a curve. The rail was designed to permit tourists to view the scenic gorge.

● *Falsework for Main Span.* As the Kentucky River is navigable here, the U.S. Engineers requested that an 88-ft. minimum horizontal opening be maintained near the center of the main 200-ft. span during construction. The falsework for this span consisted of three all-welded 100-ft. steel pratt trusses supported by two steel towers, and two 50-ft. steel beam spans supported by the towers and the concrete piers. Twelve 73-lb. H-piles were used for each tower, and 8-in. steel channels were welded to the piles to provide the necessary horizontal and diagonal bracing.

Steel sheet piles in 45-ft. lengths were used to build cells (with circular ends) around each steel tower. The cells were filled with river sand and gravel to provide additional support for the steel towers, since solid rock was only 8 ft. below streambed.

Figure 2 shows the location of construction joints for the bottom slab, vertical walls, and top slab of the 140'-200'-140' continuous unit. The bottom slabs were poured first, next the vertical walls and diaphragms, and then the top slabs. Before casting the bottom slab the forms were cambered to provide for theoretical dead load deflection of this slab. Several 6.5-in., 10-ton hydraulic jacks were placed at the falsework truss panel points in order to raise and wedge the bottom slab and hold it to plan elevations when the vertical walls, diaphragms and top slabs were being poured. Temporary openings were left in the bottom slabs to facilitate the removal of the interior forms, and after removal of forms the openings were sealed with concrete.

All spans were cambered for dead load only. Holes were drilled at points of maximum deflection along the bridge centerline, and molten lead was used to set ¾-in. round by 1½-in. brass bench-mark rod flush with the top of concrete floor. It is expected to take three or four years for the spans to loose the full dead load camber. Reading will be made semi-annually for the next four years to determine the amount of dead load sag per year.

Hollow-box-girder bridges have several advantages: great torional strength; ample space for concealment of pipes and conduits; adaptability to grades, curves, skews, and super-elevation; and excellent architectural possibilities. After bids were

(Continued on page 107)

Low Bid Prices (1954) for Box Girder Bridge

Conc-Class A-Sub.	1,900.5	CY	54.00	102,627.00
Conc-Class A-Super	1,631.7	CY	147.00	239,859.90
Conc-Class D-Rails	72.6	CY	200.00	14,520.00
Steel Reinforcement	856,467	Lb	.13	111,340.71
Excav.-Struc.-Common	4,932	CY	20.00	98,640.00
Excav.-Struc.-Rock	458	CY	20.00	9,160.00
Navigation Light System		1 Lump Sum		1,750.00
Piling-12" Steel-Furnish	2,296	LF	4.50	10,332.00
Piling-12" Steel-Driving	2,296	LF	5.00	11,480.00
Structural Steel	47,474	Lb	.35	16,615.90
Manhole Covers & Frames		1 Lump Sum		300.00
End Wall Screens & Frames		1 Lump Sum		720.00
Remove main Piers Exist Bridge		1 Lump Sum		7,000.00
				624,345.51

Bayer & Mingolla's first BatchOmatic Plant operated only a few months when the need for a second plant arose . . .

Having had actual experience with the many exclusive principles, the choice was easy. Here is their second BatchOmatic being erected.

New England contractor buys second Barber-Greene Batch Plant within a year

Experience with the fast, easy erection, automatic operation and unique versatility is what sold B & M Crushed Stone its second Barber-Greene BatchOmatic within one year. In fact, these new operating advantages are selling all three (2000-, 4000- and 6000-pound) B-G Batch Plants to contractors all over the United States and Canada.

Owners, operators and inspectors everywhere are giving their endorsement to the BatchOmatic—the first plant ever designed from its original conception for automatic operation.

Exclusive BatchOmatic features include:

Simultaneous weighing of all sizes of aggregate . . . eliminates the human element in achieving accuracy and maximum capacity.

Instant change-over from automatic to manual operation . . . provides mixes for the drive-in trade . . . instantly reset to preset repetitive cycle operation.

New Dyna-Mix pugmill . . . gives thorough coating in less time than any other pugmill.

Instant, positive inspection of aggregate gradation and weight.

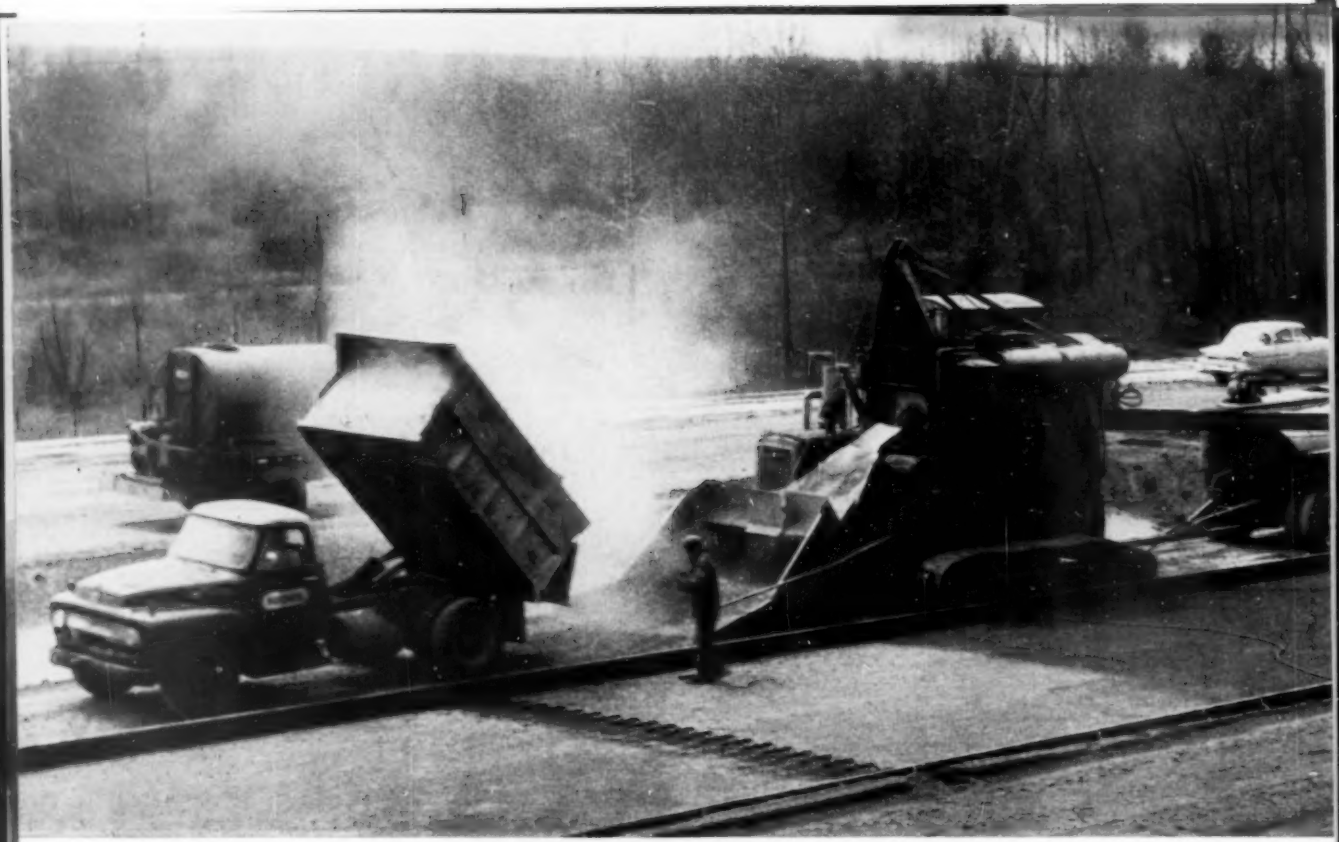
56-16-WB

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

. . . for more details circle 183, page 16



You can depend on PAVING EQUIPMENT WITH for the BIG JOBS AHEAD

BLAW-KNOX PAVING EQUIPMENT proved on Turnpikes and Superhighways across the Country

On Turnpikes and on Superhighways all across the country Blaw-Knox Concrete and Bituminous Paving equipment units have proved they have what it takes to produce big capacities to rigid specifications under tight working schedules. Among the major highway projects where Blaw-Knox equipment has been proved are: Pennsylvania Turnpike, New Jersey Turnpike, New York Thruway, Virginia Turnpike, Ohio Turnpike, Indiana Turnpike, Massachusetts Turnpike, Kansas Turnpike and the Florida Turnpike. This same equipment has proved equally successful on smaller paving projects.

In the Blaw-Knox "Complete Package" you get the most efficient concrete paving outfit available, because every piece of equipment is built by one responsible, experienced manufacturer, with each unit engineered to match the others in size, capacity and performance. Road Forms carry the Precision Subgrader, Transverse Blade Spreader and Finisher. Automatic Batching plants will keep two of the new hydraulic MultiFoote Pavers working at peak capacity.

On Bituminous Paving projects you can have the same efficient low cost production. This Blaw-Knox equipment assures you the biggest capacities for spreading the sub base material, laying the pavement mat, to finishing the shoulders. Blaw-Knox Base Pavers will spread up to 400 tons per hour of base material *without segregation.* The new Model PF-90, described on the opposite page, can handle up to 200 tons per hour of bituminous paving. The Blaw-Knox Road Widener will assure fast work of shoulder building without wasting material.

When you have a Blaw-Knox paving outfit for either bituminous or concrete paving you get preventive maintenance since all your equipment belongs to one family. It's standard practice for your Blaw-Knox trained service man to check each unit on each service call, to stop trouble before it starts.

You can get the complete story on Blaw-Knox paving equipment from your nearest Blaw-Knox distributor. Many of these high capacity units will be at the 1957 A.R.B.A. Road Show.

BLAW-KNOX PAVING EQUIPMENT

Road and Airport Forms Manual or Automatic Concrete and Aggregate Bins and Batchers Precision Subgrader MultiFoote Concrete Paver Concrete Spreader (with or without Vibratory Attachment) Concrete Finisher (with or without Vibratory Attachment) Base Pavers Bituminous Paver Finisher Road Widener Trench Roller Street and Gutter Forms Concrete Buckets

EXPERIENCE

Blaw-Knox 1957 Model PF-90 is even Better!

The Blaw-Knox Model PF-90 Bituminous Paver Finisher now has engineering advances that provide higher paving speeds and greater paving width. A wider range of paving speeds is provided with a new two-speed axle that gives a low working speed of 10 feet per minute to a high paving speed of 52 feet per minute. The PF-90 also has a higher travel speed of 7.4 miles per hour to give you greater mobility on between-paving moves.

Another important feature of the new Model PF-90 Paver is the increased paving width. It can now lay a bituminous mat 16 feet wide, three feet wider than the previous maximum width of 13 feet. This new paving width has been tested and proved on many types of operation including the Massachusetts Turnpike.

Other important features of the Model PF-90 include the rubber tire mounting which eliminates from 600 to 700 wear parts typical of crawler mounted pavers. The PF-90 also has a big 10-ton hopper so it can take a full truck load without spillage. You can see these features and many more at the A.R.B.A. Road Show next month.

BUILD BETTER ROADS TODAY · FOR A GREATER AMERICA ·

See you at the ROAD SHOW CHICAGO Jan. 28-Feb. 2, 1957

AMERICAN ROAD BUILDERS ASSOCIATION

Blaw-Knox will show the latest and best at the 1957 Road Show

The Blaw-Knox exhibit at the A.R.B.A. Road Show, from Jan. 28 through Feb. 2, 1957 will show important equipment that you will want to plan on using in your future paving jobs. Some of the equipment shown will include: New Bituminous Paving Equipment, an Improved HiBoy TRUKMIXER, Improved Automatic Batching Equipment, the Time-tested Concrete Spreader, a Base Paver, Road Widener and a Trench Roller.

The Blaw-Knox Exhibit is located at Booth 727 in the Exhibition Hall at the International Amphitheatre

BLAW-KNOX

BLAW-KNOX COMPANY

CONSTRUCTION EQUIPMENT DIVISION

44 Charleston Ave., Mattoon, Illinois

More Work-ability with

The simple, practical design of these "Euc" Scrapers with capacities of 7 and 12 yards struck is years ahead of the field. It brings you a new high in scraper performance and low cost yardage that has made Euclid the fastest growing scraper line in the industry.

Hydraulically controlled lever action provides fast, positive and independent operation of bowl, apron and ejector. Down time and delays caused by cable breakage are completely eliminated. All major components and the entire power train are readily accessible for easy servicing and maintenance.

Have your Euclid Dealer give you facts and figures on the S-7 and S-12 so you can compare them with your present equipment . . . you'll find that ***Euclids are your best investment.***

S-7

7 yds. struck . . . 8 yds. at 3:1 slope . . . 9 yds. heaped at 1:1 . . . 18.00 x 25 tires with 21.00 x 25 optional . . . 143 h.p. . . . NoSpin differential . . . non-stop 180° turn in 28 ft.

See You at the ROAD SHOW CHICAGO Jan. 28-Feb. 2, 1957

Easy maneuverability of the S-7 makes it a versatile earth-mover for a wide range of work. Full hydraulic steering permits non-stop turns in only 28 feet . . . enables the unit to get in and out of close quarters. Here a load of topsoil is being spread at a New Jersey housing project.

With its low, wide bowl and adjustable 4-section cutting blade, the S-7 is a fast, easy loader . . . picks up heaped loads without pusher assistance in good materials. This "Euc", equipped with cab, is working on a big land leveling project in the state of Washington.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

S-7 and S-12
"EUC" Scrapers

12 yds. struck... 14 yds. at 3:1 slope ... 16 yds. heaped at 1:1 ... 26.5 x 25 tires ... 218 h.p. .... 9′ 6″ width of cut ... NoSpin differential non-stop 180° turn in 31 ft.

Big 26.5 x 25 tires, NoSpin differential, Euclid planetary drive axle and 218 h.p. engine give the S-12 plenty of power and traction to pick up heaped loads in a hurry. On this Tennessee highway job, the 28 mph top speed with capacity payloads was a big factor in maintaining high production at low cost.

Contractor preference for "Euc" Scrapers results from pay-off performance on the job.

Rugged construction of the S-12 keeps down time to a minimum—it's designed for work on the toughest jobs with big push tractors. Heaped loads of heavy clay—15 yds. and more—were picked up in a short travel distance on this South Carolina railroad grading project.

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

EUCLID

GM MORE POWER FOR YOU

A Pennsylvania contractor uses a 3-yd. Bucyrus-Erie 71-B shovel to load out rock from Dale Cut on the northwestern extension of the Pennsylvania Turnpike near Wilkes-Barre. For ditching and culvert work on another section near White Haven, he assigned the job to his 1½-yd. 38-B dragline.

Bucyrus-Eries Stand Out for Ability to Stand Up

Just one more reason why Bucyrus-Erie excavators are producing profits for contractors on hundreds of roadbuilding jobs all over the country: their ability to stand up, to deliver high output month after month with minimum downtime.

Outstanding performance under toughest conditions is the result of Bucyrus-Erie's close attention to quality in the factory, etc. . . . where research and design testing and manufacturing aim for perfection in every detail. Castings for these machines are poured in Bucyrus-Erie's own foundries. Modern forging and heat treating methods assure the strength, toughness, and hardness demanded for heavy field duty.

Such careful attention pays off in machines that are designed to deliver sustained high output at low cost over a long period of time.

Let us give you the complete story of how Bucyrus-Erie ⅜- to 4-cu. yd. excavators readily convertible to lifting crane, dragline, and clamshell — plus dragshovel on machines through 2½-yd. — can boost your profit margin. 311E56

See you at the road show.
Chicago, January 28-February 2, 1957

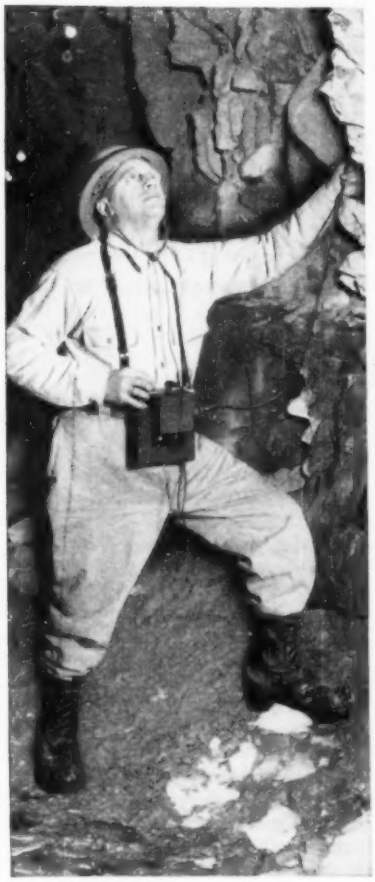
BUCYRUS ERIE

South Milwaukee, Wisconsin

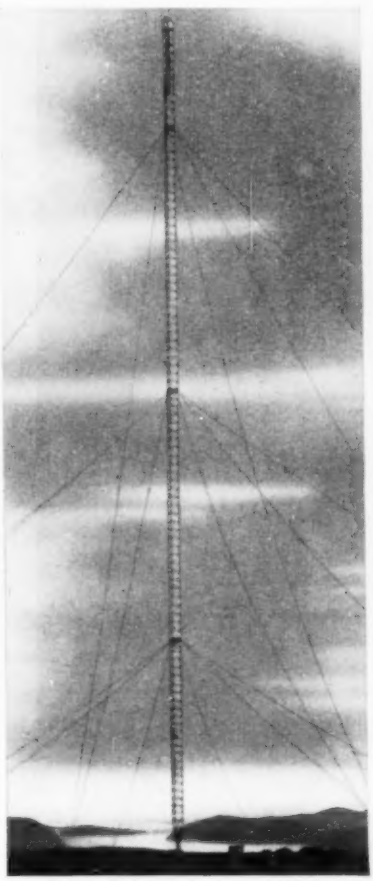
. . . for more details circle 273, page 16

A Tunnel...A Tower...A Thruway

Three jobs that prove it pays to insure with Liberty Mutual
no matter what you build, no matter where you build



THE TUNNEL: A Liberty Mutual policyholder had a contract to build a twenty-seven mile aqueduct through the Catskill Mountains. The tunnel on this project involved two intermediate shafts, and the outlet portal that had seven headings, in operation twenty-four hours a day, five days a week. To service this job, Liberty Mutual opened an office in a nearby community. On-the-spot experienced Loss Prevention Engineering, claimsmen on the job site and the full cooperation of the contractor, resulted in the return to the contractor of more than $700,000 as retrospective premium savings.



THE TOWER: One of the toughest jobs in the Thule project was the erection of a 1206-foot tower. Despite hazardous conditions in Arctic gales, only one minor accident resulted on this intricate but small part of the job. Liberty engineers watched over the safety of the thousands of construction workers on the whole Thule project. The accident record there was 75% better than the U. S. record for construction companies. Liberty's engineering approach to accident prevention and the cooperation of the contractors reduced losses. The final insurance cost for the project was millions of dollars less than expected.

THE THRUWAY: Liberty insured 64% of the mileage on the New York Thruway. The contractors worked with Liberty to put safety first. As a result of the excellent loss record, dividends and retrospective premium returns approximated a *million dollars*. Before work began, Liberty analyzed potential hazards, then kept on top of problems through local offices. Liberty engineers were always on hand and, when accidents occurred, Liberty claimsmen were on the spot to provide service. Loss Prevention Engineering has helped make Liberty Mutual the leader in compensation insurance.

For 20 straight years — the nation's largest writer of Workmen's Compensation Insurance

LIBERTY MUTUAL

The Company that stands by you

Liberty Mutual Insurance Company • Liberty Mutual Fire Insurance Company • Home Office: Boston

. . . for more details circle 229, page 16

Oversize

How Slattery Contracting Company, Inc., handled exceptionally heavy excavation for Connecticut Turnpike through suburban city of Greenwich.

Big Stones in the Fill **Good tight embankment can be constructed with some very large rocks as long as they go within the 3-foot depth of lift. Here big slabs of schist are being dumped and mixed with smaller stones. A Cat D9 easily shoved three-ton chunks into place, as delivered by the LeTourneau-Westinghouse 35-ton Model B wagons.**

It was rock literally all the way along the 3.8-mile turnpike project through Greenwich, Connecticut, where Slattery Contracting Co., Inc., cleaned up nearly all of the 800,000 cu. yd. rock excavation during the 1956 season.

This project is of special interest for a number of reasons. The rock quantity was heavy, even for today's highway work. The usual "hurry-up" atmosphere of turnpike work was in evidence. And of special interest was the fact that this job lies entirely with-

Equipment Ramrods Urban Rock Job

in the limits of a suburban community, with the restrictions that usually are involved, and then some.

Slattery's contract section, known as 302-02, begins at the New York state line at the western end of the 127-mile Connecticut Turnpike. The job is one of the score or more which are aggregating over 8 million cu. yd. of rock work and other heavy quantities. The contract was awarded early in 1956, for $7,336,000 including grading, drainage, structures and paving. Grading quantities include 805,000 cu. yd. of rock excavation and 471,000 cu. yd. of earth excavation. This heavy yardage was made necessary by the hilly terrain and by the depressed profile required to accommodate cross-street overpasses at grade.

A major consideration in planning the work was the proximity of homes and buildings, and also the fact that the job closely parallels the New Haven's 4-track railroad line requiring coordination of blasting with train passages and general care throughout.

For the heavy yardage, the contractor brought in sufficient equipment for opening up with a single spread, eventually using four shovel spreads, plus structure and miscellaneous work. Rock excavation began in April and was hampered at times during the early weeks by the lag in right-of-way clearance, and scarcity of disposal areas for waste excavation material.

• *Compressors and Drills.* Supporting the four Northwest 2½-yd. 80-D shovels at four locations, Slattery used nine Jaeger 600 cfm compressors, one Chicago-Penumatic 600 and one C-P 900 Power Vane compressor, one Worthington 600 and one LeRoi 600—or a total of 8,100 cfm combined compressor capacity. Also a Jaeger 125 for secondary shooting. For drilling, 10 Gardner-Denver Air Tracs (using 450 cfm each) and 4 Chicago-Pneumatic Tracdrils (rated at 375 cfm) have been used.

The superintendent tried to supply the drills with plenty of compressor capacity. For example, to keep up with a 2½-yd. shovel, drilling was done, say with 3 Air Tracs pushed by 1,800 cfm of air, which allowed ample reserve supply to insure top drilling production. Only occasionally a fourth Air Trac was hooked up to the manifold with 1,800 cfm of air, although normally this ratio might be considered sufficient by some contractors. A noteworthy special combination at one shovel consisted of the new C-P 900 cfm Power Vane compressor driving a pair of Air Tracs.

• *Hauling and Spreading.* Hauling equipment for shovel rock consisted of 5 LeTourneau-Westinghouse Model B 35-ton rock wagons and 5 Euclid 25-ton end-dumps. The Model Bs came equipped with 300-hp Cummins diesel engines and electric regenerative retarders for downhill braking.

Rock spreading on the fills was required to be done in 3 ft. maximum lifts without rolling, but with careful mixing of fines among the big stones and keying by passage of the bulldozer. Eight heavy dozers served the four shovel areas, these including a Euclid TC-12 twin engine unit and a Cat D9.

The D9 was observed in an exhibition of the value of an over-size dozer for spreading big rocks. Huge elongated blocks of schist which taxed the Northwest shovels to load were spread in the outer reachers of the lower fill lifts, without necessity of secondary shooting. Their embedment

Plenty of Air **A Jaeger 600 cfm compressor is here teamed up with three Chicago-Pneumatic Tracdrils (only two in camera range) along with a second compressor, in hookup which assures 400 cfm per drill. One of several typical drilling spreads on the Slattery project.**

Rock Excavation Methods on the Connecticut Turnpike

•

2nd in a Series

900 cfm Compressor A Chicago-Pneumatic 900 cfm Power Vane rotary compressor, balanced with two Gardner-Denver Air Tracs—supporting equipment for one of Slattery's four rock shovels.

Another Oversize Dozer Fast spreading of material involving large stones was also performed in one location with a Euclid TC-12 twin-engine dozer.

was permitted as long as the 3-ft. layer limitation was observed. Some of these big slabs, weighing many tons, were of a size that would stall or seriously slow a lessor tractor. The D9 on this operation was paired with a D8 which pushed finer rock materials over the layer to fill the voids.

In several locations early in the job, the contractor "made money" by being able to doze blasted rock laterally directly into position on side-hill cuts, without loading into wagons. Hauls have been relatively short generally, hence the ratio of only 2.5 wagons per shovel.

● *Drilling and Blasting.* The rock encountered was very hard, dense mica schist, found nearly everywhere to be heavily and irregularly fissured, with seams running "every which way." "The hardest, blockiest rock we ever encountered," were the foreman's words. It has also varied extremely in hardness and grain direction.

Drilling with the Gardner-Denver Air Tracs was done usually in 8 x 8 ft. hole patterns. Brunner & Lay 3-in. tungsten carbide tipped bits are employed with 1¼ in. hexagonal sectional drill steel. For the Chicago-Pneumatic Tracdrils, bit sizes included 2⅝, 2½ and 2⅜ in., using 1½-in. round sectional steel, with hole spacing 6 x 6 to 7½ x 7½.

Lifts in this job were usually about 15 ft. depending on the cut. However, the largest cut, 58 ft. maximum depth, was taken down in a 30 ft. and a 28 ft. lift. A few other locations were drilled in single lifts of 20 to 30 ft.

Blasting was done with duPont explosives furnished by Danbury Explosives, of Danbury, Conn., this supplier delivering daily in special trucks, and unloading materials directly at the drilling site or into safety storages provided. Special Gel 40% special

Explosives Handling Explosives totaling as high as 30,000 lb. per week were delivered twice daily in special trucks and stored in the approved weatherproof storages here pictured.

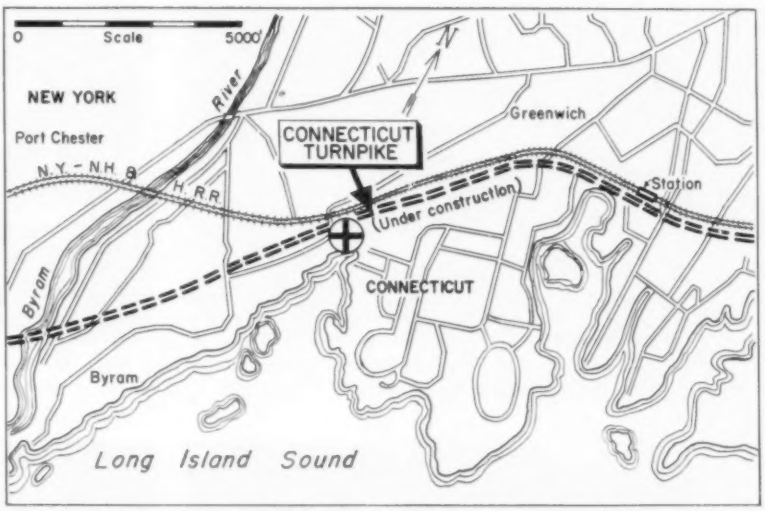
Swath Through Home Neighborhood Note width of the workings in grading for today's multi-laned expressways. Plenty of room for big equipment to maneuver freely, despite proximity of homes. The New Haven Railroad main line lies immediately to the right.

gelatine and Red Cross 40% extra ammonia type powder for the top load were used generally with electric caps loaded in the hole. A new duPont CD 48 condenser-type blasting machine with capacity of 120 holes has been employed. A typical shot witnessed consisted of 185 holes ranging from 12 to 20 ft., loaded with 2-in. powder totaling 2,400 lb. Stemming was placed in the upper 9 to 12 ft. of hole, rest of hole packed solid. Smaller blasts were used under restricted conditions or for smaller cuts and clean-up work.

● *Trainman's "Go Ahead."* Following conference with railroad officials, a procedure was adopted in which a trainman spotted along the tracks opposite each blast area would get the "all clear" by telephone from the dispatcher's office, then wave to the blasting foreman to blast. The railroad insisted on a minimum of 30 minutes between the blast and passage of the next train, due to the close proximity of the paralleling highway excavation.

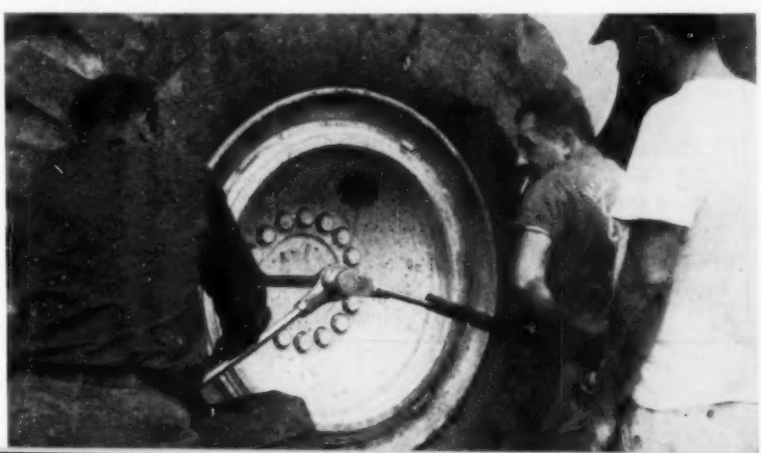
The time honored custom of blasting each evening after work was ruled out because of the rush-hour train schedules. The company hence decided to time its blasting whenever possible during the noon-time lunch break. This timing has been followed. Despite the fullest cooperation of the trainmen, however, delays—with shovels and compressors pulled back and waiting—have ranged as high as 40 minutes per shovel, with as much as 90 minutes of delay per day for the four shovels combined.

Despite delays for railroad trains, lack of acquired and cleared filling area at times, and other hampering



● How the Connecticut Turnpike cuts through Greenwich and flanks a railroad line for much of the distance.

Right Tool for the Job Tightening studs on wheel of a LeTourneau-Westinghouse Model B 35-ton rear-dump. Bonny reduction wrench being used by dealer's service men.



Step-by-Step: Stowing Away 35-Ton Load

1 Is this stone rated as oversize? Or will it go into a 3-ft. lift? Looks OK, let's heave her in.

2 Following several dippers of finer stuff, here is another one-tonner. All helps build up a load.

3 Trick is to lay up the big stones around the edges. Better nudge this one into better position.

4 More small rock and dirt. Beginning to look like a payload. The fines will help fill voids.

5 Now for the 700-foot haul. Hope Bill has made a grader pass to iron out those rough places in the haul road.

6 Off with another 35 tons of rock, to help toe out one of the lower lifts for a 30-foot sidehill embankment on the Connecticut Turnpike.

Contractor is Slattery Contracting Co., Inc., on the Connecticut Turnpike. Equipment shown: a LeTourneau-Westinghouse Model B rear-dump and a Northwest 80-D 2½-yd. shovel.

Steel Up Out of Dirt Hexagonal drill steel sections when not in use, were kept stored off the ground in recommended manner.

Clean New Grease Rig This contractor believes that even the lowly grease truck should be road-worthy and presentable looking. Curtis-equipped for dispensing all grades of oils and lubricants; also compressed air and water when needed.

problems, the four Northwest 80-D shovels, working six day shifts per week, have moved 30,000 cu. yd. or more per week.

Progress in rock work, despite the delays due to the railroad and at times for lack of available filling area, has been considered satisfactory by both the engineers and the contractors. During the first week in August, for example, with four shovels working most of the time, about 30,000 lb. of explosives was used in making a 30,000-yd. week. The rock work which may exceed 900,000 cu. yd. when the job is done, was scheduled for completion by Christmas. Double-shift operation was necessary through the autumn months.

This review does not attempt to describe the many other aspects of this rather complicated project, nor all of the various equipment from the Slattery equipment pool. Special citation, however, is due the firm's RCA radio-telephone equipment, consisting of four mobile units and a field office unit. Even on this relatively short job within the corporate limits of a city, radio communication has greatly expedited the field management.

Patrick Kelly is superintendent for Slattery Contracting Corporation on the Connecticut job, Len Peterson is project engineer and Ralph Hacket, drilling foreman. The project is under the Connecticut state highway department, the firm of Gannett Fleming Corddry & Carpenter, Inc., serving as contracting engineers. The section is to be paved and structures completed during the 1957 working season.

BLASTING RECORD

Company .....

Date: ..... Time: ..... A.M. ..... P.M.

Job Location: .....

Type Stone	Hard	Medium	Soft
Ledge			
Rock			

Type Explosive ..... No. Sticks .....

Method of Ignition: Fuse .....

Primacord ..... Elec. Caps. .....

Delay Elec. Caps. Interval .....

Holes: No. ..... Depth .....

Dist. between holes .....

Mats: Type ..... Size .....

Preblasting Inspection: Yes ..... No .....
(If yes, describe on back side)

Complaints: Yes ..... No .....
(If yes, describe on back side)

Blaster .....

Super. .....

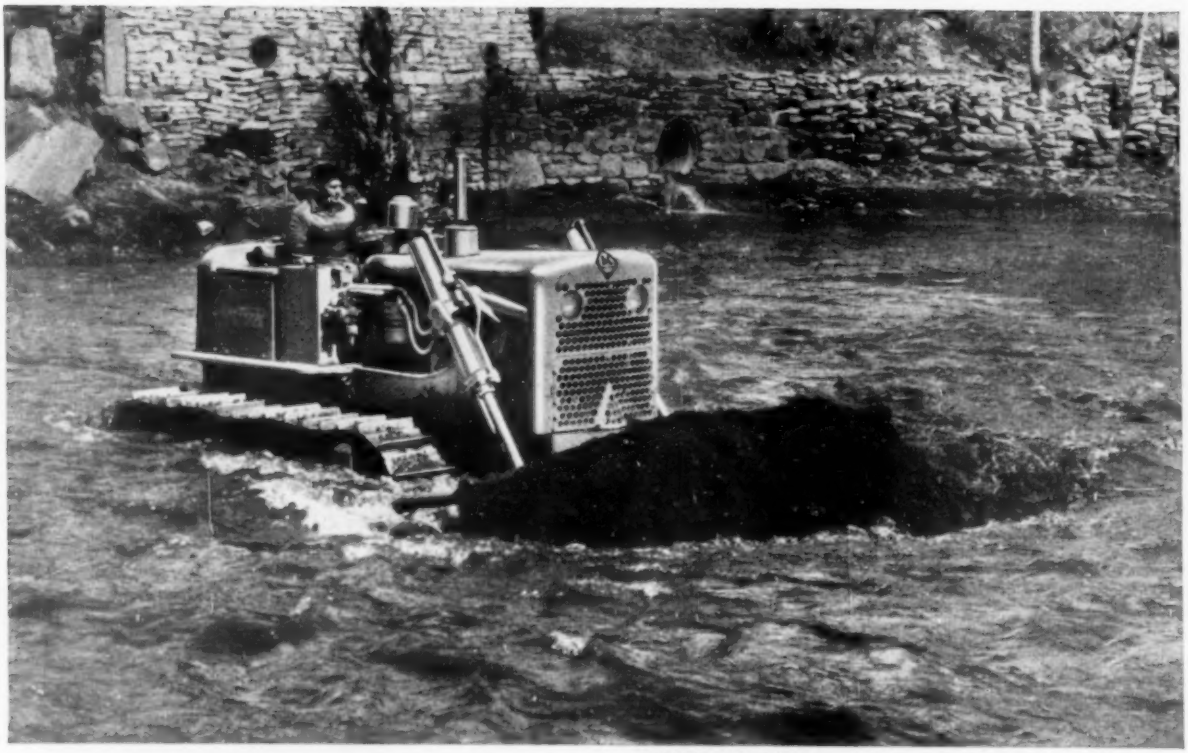
S-540.072

Systematic Blasting Records Card used by the Slattery foremen for keeping a log of his blasting.

Blast Alarm

Before blasting, the foreman sometimes sounded a warning with this horn device. It's a Falcon horn mounted on a valve-equipped vaporizing can.

See forthcoming issues of Roads and Streets for more job reports on latest handling of heavy rock excavation



HD-11B 94 belt hp • 24,800 lb (approx.) as shown

Restoring river bed after heavy flood requires track-deep operation in water and silt

Positive Seals in Allis-Chalmers HD-11B tractor effectively keep out damaging dirt and water

Considerable work was required in Scranton, Pa., recently to restore the Lackawanna River bed and banks after a disastrous flood had caused waters to rise 15 to 20 feet above normal. Channels had to be cleared, creeks widened, dikes built on river banks and, in some places, the river even had to be changed back to its original course.

Restoration work was carried on by Sweeney Brothers, Scranton contractors, under the direction of the Pennsylvania Department of Forests and Waters. Key machine on one phase of the project, an Allis-Chalmers HD-11 tractor-bulldozer, often worked track-deep in water and silt while clearing channels of mud and wreckage. The dozer also maintained roads for the fleet of seven trucks hauling material from the river.

The HD-11B proved to be an ideal machine for this job, according to Thomas J. Collins, Sweeney Brothers president. "This is our first piece of Allis-Chalmers equipment and I'm happy with it. The unit has been subjected to very tough conditions and has stood up well. Considerable saving has been made because Allis-Chalmers 1,000-hour lubrication seals keep dirt and water out of truck wheels, rollers and idlers."

The spring-loaded *Positive Seals* that permit 1,000-hour lubrication on truck wheels, idlers and support rollers are only one of the many outstanding features of Allis-Chalmers tractors.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

BUILD BETTER ROADS TODAY · FOR A GREATER AMERICA · See you at the ROAD SHOW CHICAGO Jan. 28-Feb. 2, 1957

. . . for more details circle 271, page 16

"We're getting
300 TONS PER HOUR of 3/4" GRAVEL
with 50% to 70% CRUSH—
365 TONS PER HOUR of 1" GRAVEL
with our CEDARAPIDS UNITIZED PLANT"

says A. H. SCHROBER, Schrober Construction Co., Loyal, Wisconsin

900,000 TONS OF GRAVEL HAVE GONE THROUGH THIS CRUSHER

. . . and there's still plenty of life left in the jaws! It's no wonder A. H. (Tony) Schrober says "There's nothing like the jaw life of our Twin Jaw Primary. We turned the jaws at 525,000 tons and when this picture was taken, over 900,000 tons had gone through. The ribs still protruding indicate there's still a lot of service left in these jaws, and we expect to go over a million tons easily before replacement."

Production is another reason Tony Schrober is well pleased with his Cedarapids equipment. This Unitized Plant is turning out 300 tons per hour of 3/4" gravel, with 50% to 70% crush, and 365 tons per hour of 1" gravel. That's a good reason why he has taken delivery on another Cedarapids plant.

When there's a high percentage of oversize in the pit, and material is abrasive—leave it to A. H. Schrober to solve the problem *profitably*. He uses a Cedarapids Twin Jaw Primary Unit to handle the 50% to 70% crushing and get increased capacity . . . and to sharply reduce abrasive wear on the jaws. For secondary reduction and gradation he uses a Cedarapids 4024 Roll Crusher Secondary. It's the perfect combination for the performance Mr. Schrober likes . . . output of 2700 to 3300 tons per day in tough crushing conditions, steady operations day after day, and low maintenance costs.

Your Cedarapids distributor can help you choose the aggregate producing or bituminous mixing plant which will meet your requirements for capacity, specifications and low cost.

BUILD BETTER ROADS TODAY · FOR A GREATER AMERICA · See you at the ROAD SHOW CHICAGO Jan. 28-Feb. 2, 1957 AMERICAN ROAD BUILDERS ASSOCIATION

IOWA MANUFACTURING COMPANY
CEDAR RAPIDS, IOWA, U.S.A.

. . . for more details circel 222, page 16

Euclid 'TWINS' will move the CHEAPEST DIRT on the big road program ahead!

- Twin-Power "Eucs" out-perform all other equipment by a wide margin — the *profit* margin
- "Twins" move more yardage . . . wet or dry . . . hard clay or loose sand
- Contractors with "Twins" have a bidding advantage
- "Twins" can set new production records at lower cost on *your* jobs

Euclid Equipment

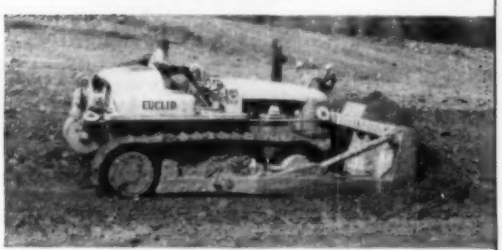
FOR MOVING EARTH, ROCK, COAL AND ORE

TC-12 TWIN-CRAWLER TRACTOR

'EUC' TWIN-POWER SCRAPER

To move dirt at the lowest cost set your sights on Euclid "TWINS"

Because it self-loads in any scraper material, the Twin-Power Scraper works independent of other equipment. It is revolutionizing road building methods on jobs where concentration of equipment in any single cut is not practical.



Unequalled power, speed and maneuverability make the TC-12 a top performer. It has all the features you've wanted in a big crawler.

Ask your dealer for proof that Euclid "Twins" are your best investment

- Check actual production figures from a wide range of jobs
- Compare "Twin" performance with that of your present equipment
- See movies of "Twins" at work on jobs like yours
- Check the list of owners who are using "Twins" to cut their earthmoving costs

Get in touch with your Euclid Dealer today!

EUCLID DIVISION, GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Announcing

a new "package"
for the road builder

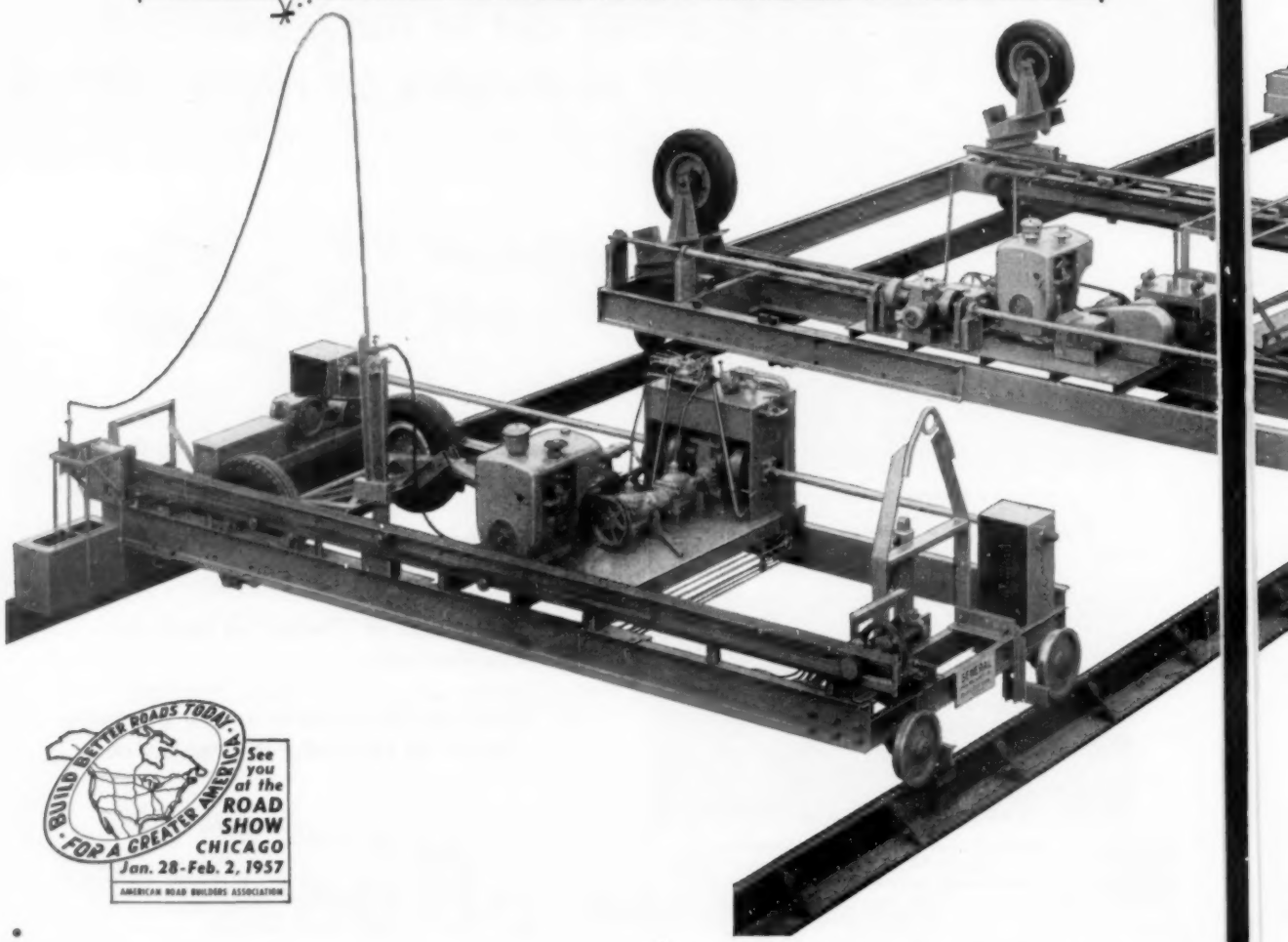
REX®

CHAIN BELT COMPANY

GENERAL ROAD MACHINES

Pavers **Forms** **Subgrade Planers**
Spreaders **Finishers** **Floats** **Curing Machines**

The *Complete* Line of Portable, Powered-Frame Widened Concrete Paving Equipment



BUILD BETTER ROADS TODAY · FOR A GREATER AMERICA ·
See you at the ROAD SHOW CHICAGO Jan. 28-Feb. 2, 1957
AMERICAN ROAD BUILDERS ASSOCIATION

REX GRM

Here's the job-speeding, cost-cutting concrete road building "package" contractors have been seeking. The combination of CHAIN Belt and General Road Machines provides a complete equipment answer from forms to curing machines—a quality line of concrete paving equipment that is unmatched in its ability to answer your needs...unequaled in its over-all ability to speed job progress.

Now, from a single source, you can get pavers, spreaders, finishers, floats, curing machines, forms, subgrade planers—the complete package of concrete paving equipment. A single source of responsibility means better equipment performance for you...matched quality that adds up to lower cost operation.

Why not get the complete story on the new package that can step up your paving profits...the many exclusive features offered only by these quality machines. Write CHAIN Belt Company, 4632 West Greenfield Ave., Milwaukee 1, Wisconsin.

CONSTRUCTION REX MACHINERY

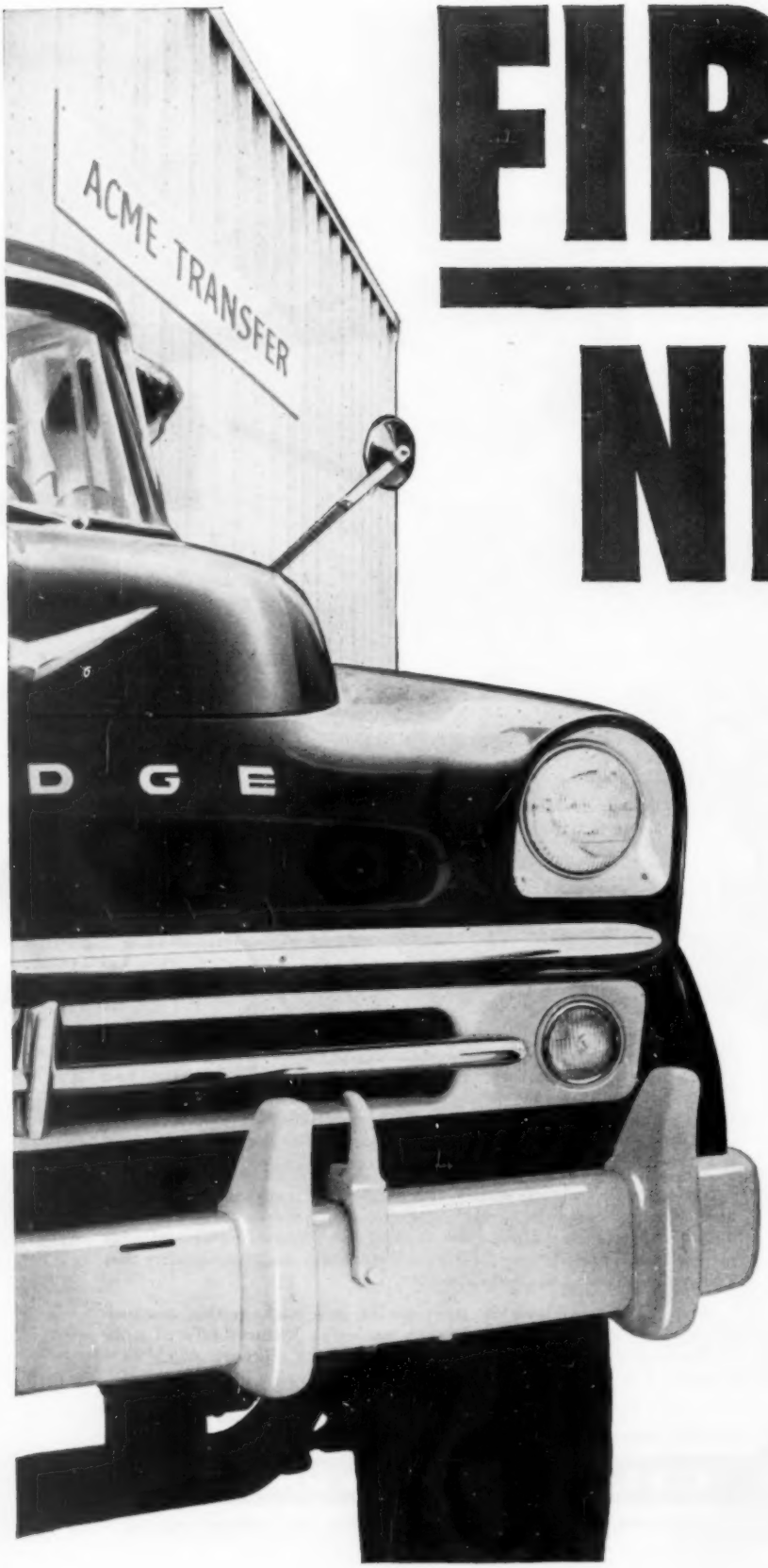
PAVERS • SPREADERS • FINISHERS • FLOATS • CURING MACHINES • FORMS

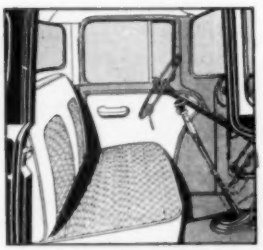
CHAIN BELT COMPANY

MOTO-MIXERS • BUILDING MIXERS • PUMPCRETE • RAILPORTER • PUMPS

. . . for more details circle 283, page 16

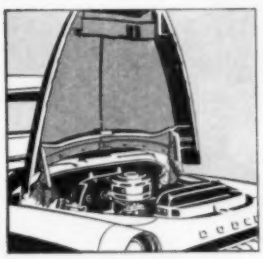
FIRST NEW





NEW COMFORT CABS

Industry's largest, for real stretch-out comfort. All-new seat design permits adjustment of back cushion and seat height, plus normal slide positioning.



FULL-OPENING HOOD

Exclusive!—Can be raised full 90° for easiest, fastest engine servicing, half-way for routine oil and water checks.

Stake models up to 21,000 lbs. G.V.W.

SHOWING

DODGE

PowerGiants

- **NEW giant-power V-8 engines!**
- **NEW push-button driving!**
- **NEW higher load capacities!**
- **NEW *Forward* Look Styling!**

Get set to profit from a great *new* kind of truck—with *more* V-8 power and *more* payload capacity—with *more* eager-to-go snap than any other make on the road!

From 204-hp. pick-ups to 232-hp. tandems, today's new low-priced V-8 Dodge *Power Giants* deliver more truck per dollar—and more profitable payloads—in *every* weight class, 4,250 lbs. G.V.W. to 65,000 lbs. G.C.W.

New short-stroke Chrysler-engineered V-8's—with exclusive Power-Dome combustion—give you more miles per gallon, full power on *regular* gas. Increased power in famous, dependable Dodge 6's, too.

Push-button automatic transmission is still another great plus you get only in new Dodge *Power Giants.** First in any truck! Simple, sure, trouble-free. Just push a button, shifting is automatic.

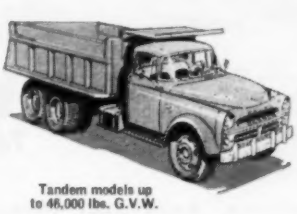
Test-drive a Power Giant—V-8 or 6—soon! Get your Dodge dealer's deal *before* you decide on your new truck.

**Available on low-tonnage and forward-control models.*

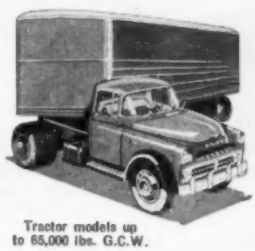
DODGE TRUCKS

WITH THE *FORWARD* LOOK

4 pick-up models up to 8,800 lbs. G.V.W.



Tandem models up to 46,000 lbs. G.V.W.



Tractor models up to 65,000 lbs. G.C.W.

4-wheel-drive models up to 18,000 lbs. G.V.W.

. . . for more details circle 189, page 16

Lima Crane with Twin Disc Single-Stage Torque Converter "...fastest thing we own"

says Ohio Contractor

"I've watched this machine carefully, and it is the fastest thing we own," says Assistant Project Engineer Jack Hickey, of Baker & Hickey, Columbus, Ohio, contracting firm. "This is the smoothest . . . too, especially on pile-driving operations. And I know the torque converter is absorbing those tremendous shocks."

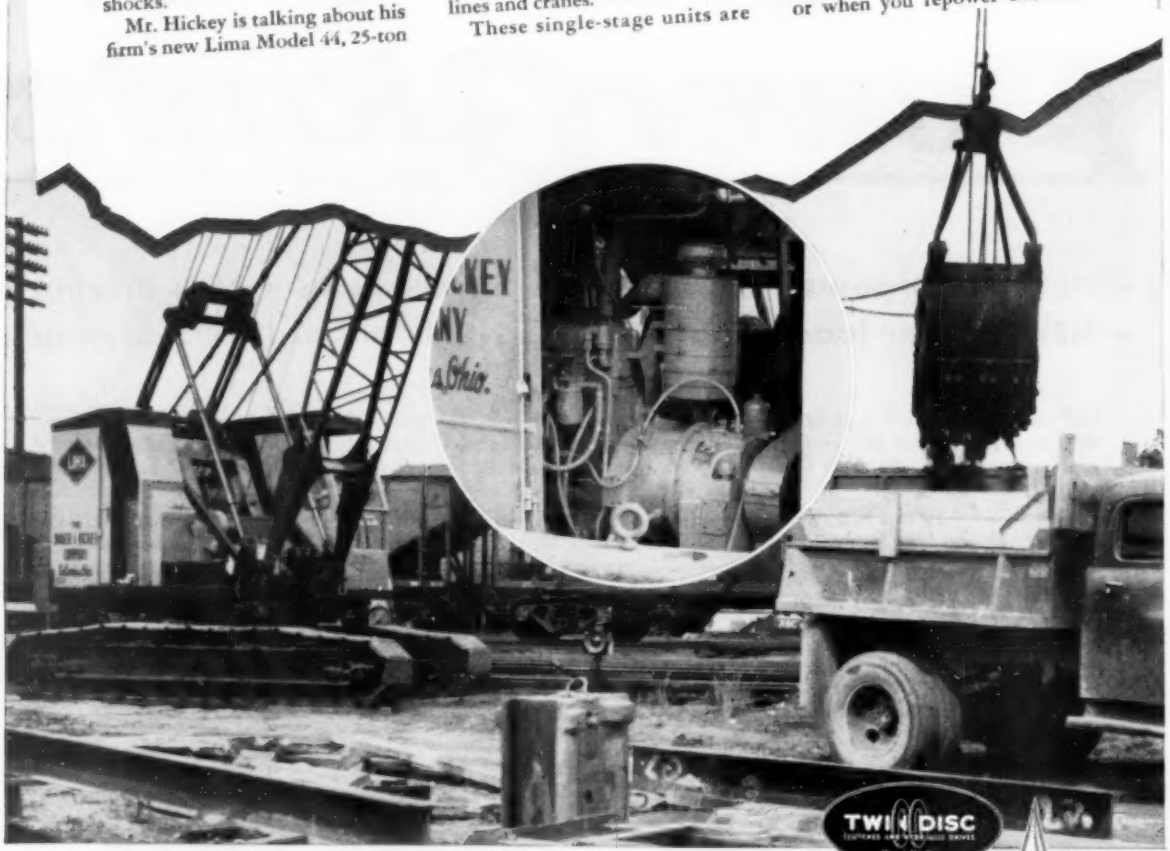
Mr. Hickey is talking about his firm's new Lima Model 44, 25-ton Crane equipped with one of the new Twin Disc 1500 Series Single-Stage Torque Converters . . . and the underpass and bridge construction work it is doing on the Columbus and Sandusky Expressway.

Like Baker & Hickey, more and more contractors are specifying Twin Disc Single-Stage Torque Converters in their shovels, draglines and cranes.

These single-stage units are designed expressly for just such work. They provide smooth torque multiplication to just the exact ratio required, and permit delicate "inching" or "holding" of loads under power.

Fluid connection cushions *out* damaging shock loads and vibrations, protecting *both* driving and driven equipment. The result is *reduced* maintenance costs, *extended* cable life, *increased* profits!

Specify Twin Disc Torque Converters for *your* new shovels or when you repower old ones.



Write today for full details on Twin Disc Torque Converters — both single-stage and three-stage.

Left. Baker & Hickey's new Lima 25-ton Crane loading with a clamshell bucket at Columbus, Ohio. *Inset.* Powered by a Cummins JBIS Diesel Engine, the Lima Crane uses a Twin Disc Single-Stage Torque Converter to transmit power smoothly and efficiently.

TWIN DISC
Torque Converters

Twin Disc Clutch Company, Hydraulic Division, Rockford, Illinois

. . . for more details circle 259, page 16

Box Girder Bridge

(Continued from page 84)

received and before the contract was awarded, careful alternate estimates were made (1) for a cantilever suspended steel deck plate girder superstructure; (2) steel through truss for the main river span and steel deck plate girders for remainder of the bridge. The bridge costs based on these estimates did not indicate that any savings could be made over the design adopted.

Shown in the table are unit bid prices for the concrete hollow-box-girder bridge as awarded to Harry O. Wyse.

J. R. Odell, senior design engineer, and his bridge squad designed and prepared plans for this Federal-Aid structure under supervision of the writer and G. A. Scott, assistant director of bridges. Mack Galbreath, district engineer (now retired), represented the Bureau of Public Roads. J. C. Cobb is present district engineer for the Bureau.

Robert Humphreys is commissioner of highways; Bert Kiser, deputy commissioner; D. H. Bray, chief engineer; H. R. Creal, first assistant highway engineer, special assignment structures; T. H. Baker, director of construction; W. S. Todd, bridge construction engineer; J. J. Pollitte, chief location engineer; R. L. Campbell, highway district engineer and E. B. Estes, resident engineer.

New Publications

Excavator maker's history

"Designed for Digging" a 384-page illustrated history of the world's largest producer of excavating equipment, has been published by the Northwestern University Press at Evanston, Ill. It is the second volume in the University's studies in busines shistory.

The book covers the first 75 years of the Bucyrus-Erie Co., whose excavators have rearranged more of the face of the earth than those of any other manufacturer. Illustrated with more than 180 photographs, the volume traces the company's development from its beginnings in 1880.

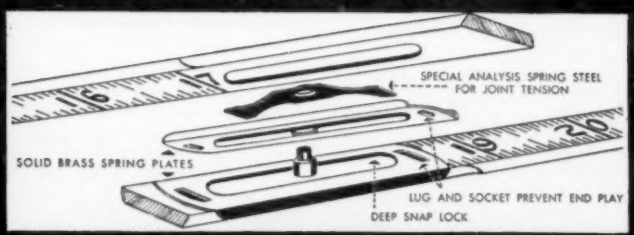
Written by Harold F. Williamson, professor of economics, and Kenneth H. Myers II, associate professor of industrial management, the book is one of the first business histories to deal with a manufacturer of heavy capital equipment.

(Continued on page 113)

A busy New York City street was treated to the sight of huge 12-ton pile hammers pounding away at 1,600 H-beam piles into "made" ground to provide foundations for the South Street Elevated Highway. The piles varied in length from 35 ft to more than 200 ft and the contractor, Fehlhaber Corporation, used S10 Single-Acting Pile Hammers, manufactured by McKiernan-Terry Corporation, 30A Mercer St., Dover, New Jersey, to do the work.

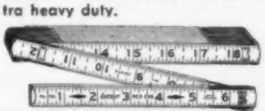
. . . for more details circle 235, page 16

WHY LUFKIN NEW Spring Lock Joints guarantee accuracy longer


SPECIAL ANALYSIS SPRING STEEL FOR JOINT TENSION
SOLID BRASS SPRING PLATES
LUG AND SOCKET PREVENT END PLAY
DEEP SNAP LOCK

Exclusive on "RED END" Folding Wood Rules

X-46 EXTENSION RULE
6" brass slide for inside measurements. 50% heavier wood for extra heavy duty.



066 — RED END RULE
All Red End features but without extension.

066-D ENGINEERS RULE
Red End quality, marked feet, 10ths and 100ths; and feet, inches and 16ths.

Exclusive Lufkin "Spring Lock" joints lock securely . . . eliminate end play . . . and maintain accuracy. Red End rules are straight-grained hard maple, tough and flexible. Bold black markings embedded in wood. Plastic coated for longer wear.

BUY LUFKIN
TAPES • RULES
PRECISION TOOLS
FROM YOUR SUPPLY STORE

THE LUFKIN RULE COMPANY
SAGINAW, MICHIGAN

BETTER MEASURE WITH LUFKIN 399

. . . for more details circle 233, page 16

Tractor-Shovel Wins Stockpile Battle

How harsh, angular coarse aggregate for Kansas Turnpike project was rehandled on Kansas Turnpike project.

A CONTRACTOR whose eye saw production advantages in certain equipment, has solved what seems to be a general problem on the Kansas Turnpike. With grading and structure contracts largely out of the way as of last season's end, 1956 was the year when astronomical amounts of crushed-stone base and paving work had to be handled to get the new toll facility open by October 1. Handling the crushed limestone, especially from stockpiles, has been a real problem.

Anderson-Oxandale, contractors from Herington, Kansas, satisfactorily met the problem by loading 17-ton truck and trailer combinations in three minutes per load using a Michigan 175-A tractor shovel of 2¾-yd. capacity.

In order to place 18 in. depth of granular base-course material for load distribution under the two traffic lanes, design engineers were forced to go 100 per cent to crushing of solid native limestone formations. There are no gravel deposits in the southeastern quadrant of Kansas where this part of the big highway is located.

The turnpike aggregate contracts of which the Anderson-Oxandale job was typical ran between 350,000 and 550,000 tons. Much of the crushing was done through the winter and late spring when weather and ground conditions made it impossible to haul the material out to the highway. To get ahead, Anderson-Oxandale stockpiled a large supply of crushed limestone.

Loading Material

Loading this material from a high stockpile, however, was not as easy as it might seem. The crushed limestone tends to set up a surface crust about a foot thick, which calls for definite digging and hoisting power to break it loose. The faces of these high stockpiles, under loading tended to stand almost vertically. Inevitable top caving occurs from time to time, and it could cover a machine up unless the equipment was unusually nimble on its feet. Crawler-mounted and endless-bucket-type loading equipment has not worked out too successfully on most of the contracts because of these conditions. Some of the contractors even have invested in 2 and 2½ yd. power shovels to do this job.

The Anderson-Oxandale solution to use the rubber-tired Michigan 175-A tractor shovel, under sustained working conditions, resulted in handling 340 tons per hour, which is considerably more than the production potential of the rock plant. After spring weather opened up, and hauling trucks could take their loads directly to the highway from the surge bin of the rock plant, the 175-A whittled the size of the stockpile down considerably by starting work at seven a.m. and loading trucks for an hour before the plant began operation at eight a.m. Whenever the rock plant was down for any reason, the machine also was available to load from stockpile, thus keeping the truck drivers occupied. Stockpile loading also made it possible for compaction equipment out on the toll road to continue operating, even if the rock plant was down.

During the hours of plant operation, about 35 tph of clay and dirt was wasted out of one side of the plant. This waste dirt accumulated unless it was moved, periodically, to a waste area. The tractor shovel was made to order for this purpose because of its rubber-tire speed, agility and large-bucket capacity. The machine also had sufficient maneuverability to work around under conveyor belts, cleaning up small piles of spillage.

The solution of attendant auxiliary problems like this are often the key to high-productive working time of all other equipment on the job. Such, the plant superintendent said, was the case on this installation.

● This 2½ yd. shovel proved powerful enough to bite into the coarse, tightly packed stone and keep up with high-speed base and paving on Kansas Turnpike.

KOEHRING LISTS NEW REPRESENTATIVES. H. R. Powers has been named district representative for Koehring Co., Milwaukee, Wis. in the Pacific Northwest area covering four states; Washington, Oregon, Idaho and Montana. He also will represent Koehring subsidiary firms, Parsons Co. and Kwik-Mix Co. C. W. Andresen has been appointed southwest district representative. He will represent Kowhring and two subsidiary firms, Parsons Co. and Kwik-Mix Co. The territory to be covered by Andresen includes Texas, New Mexico, Louisiana, Oklahoma and Mexico. L. J. Meyers will cover the South Central area as district representative. He will maintain contact with distributors of Koehring equipment as well as those handling the products of Parsons Co. and Kwik-Mix Co.

"Dairyland" contractor's big grader speeds U.S. 41 project

Safer winter driving for 24,000 vehicles daily

Boiling-up a full blade-load of "buckshot" clay, Stack Construction Co.'s "660" grader cuts final sub-grade between north- and south-bound lanes on U.S. 41 south of Milwaukee, Wisconsin.

When there are two motor graders on a job and one is an Adams 660, invariably the tougher jobs are assigned to the big, powerful "660". Here's how a Milwaukee contractor divided the work on a recent Wisconsin highway improvement project:

Removed winter-driving hazard

Slippery pavement was a hazard to about 24,000 vehicles daily traveling on U.S. 41, just south of Milwaukee. Along 9½ miles of this busy 4-lane divided highway, the 45' median-strip was higher than the road. Snow could not be pushed far off the roadway. Melting snow drained across the highway, kept the pavement wet and slippery, often froze into glare-ice when the temperature dropped.

Wisconsin State Highway Commission awarded Stack Construction Co., Milwaukee, a contract to remove the high middle-ground, and provide proper drainage. For dirtmoving, contractor used 3 C Tournapulls and 2 "D's", push-loaded by a rubber-tired Tournatractor. An Adams 660 and another grader did the blading.

Without interruption to busy highway traffic, Stack moved excess earth and cut a V-slope to provide drainage between traffic lanes. Contractor graded the island strip from road-shoulder height to 18" below grade at the center, and installed 12" feeders to carry surface water under the roadway to a drainage ditch.

"660" handles heavier work

Stack Construction Co. assigned the big 8-speed Adams 660 grader to their big-volume dirtmoving "team". The 150 hp "660" used its extra-power to scarify hard-packed cross-overs. Working in the tough, dry, "buckshot" clay, the Adams assisted scrapers...plowed up windrows of dirt for partial self-loading of Tournapulls. And blading at speeds, sometimes as high as 4.7 mph in 3rd gear, "660" cut the final sub-grades before the installation of drainage pipes.

Contractor assigned the lighter finishing tasks—spreading and grading top-soil, backfilling, and surfacing shoulders — to its slower, 6-speed, medium-weight, 115 hp grader.

Finished ahead of schedule

Leonard Stahoski, Secretary and General Superintendent of Stack Construction Co., feels that the Adams motor grader helped put their Highway 41 job ahead of schedule. "The Adams is very powerful and maneuverable for its size," says Mr. Stahoski. He adds, "This '660' has done everything asked of it, keeping our jobs on schedule."

The main reason why

Whether it's a "660" or any other Adams heavy-duty grader, the Adams is usually given tougher work. That's because only Adams has 15 speeds... 8 forward, 4 reverse, 3 optional creeper speeds. Compared to competitively priced graders, all heavy-duty Adams machines have more power-speed combinations...deliver more horsepower through anti-friction drive-train...provide more usable push-power on the blade.

On models 660 to 330, the Adams transmission gives you higher reverse speeds (12.2 to 13.7 mph) and faster road speeds (23.3 to 26.0 mph), which cut non-productive travel and shuttle time to the barest minimum. As a result, Adams helps you get more work done, speeds blading, increases productivity of other machines . . . pays you a bigger return on your investment in grading machinery.

See Adams graders in action

Call or write us, and ask to see an Adams motor grader at work. See for yourself why Stack Construction Co. and other leading contractors select Adams for their really tough jobs. Choose from 6 grader models:

New POWER-Flow 660	190 hp	
with torque converter		30,200 lbs.
Model 660	150 hp	30,050 lbs.
Model 550	123 hp	26,370 lbs.
Model 440	104 hp	24,080 lbs.
Model 330	80 hp	23,020 lbs.
Model 220	60 hp	15,500 lbs.

(Weights shown are usual working weights)

Adams, POWER-Flow—Trademark, Tournapull, Tournatractor—Trademark Reg. U.S. Pat. Off. AG-30-H-b-6

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

ARBA

See you at the ROAD SHOW • Chicago • January 28-February 2, 1957

In place of wasteful and uncertain crankcase-oil changing based upon mileage or hours in service, many operators of heavy-duty construction equipment now use a better guide that saves them both time and money.

Now you can test used oil in minutes

IT HAS COME as something of a surprise to some maintenance men to discover that they have been throwing away hundreds of gallons of still-good oil . . . year after year. Conversely, it is quite a jolt to realize that a costly engine-repair job could have been prevented by an on-the-spot analysis that would have shown up the condition . . . in minutes!

The recommendations for oil changes issued by engine makers have always been computed on "averages" for the various classes of vehicle service. And like the "average" man on the insurance chart, the average vehicle doesn't exist in the actual fleet. For example, two bulldozers of the same make and model, operating on the same job, can have quite different patterns of oil economy and engine condition. Obviously no one set of rules can apply ideally to all units. And fortunately there is no longer any need for such generalization.

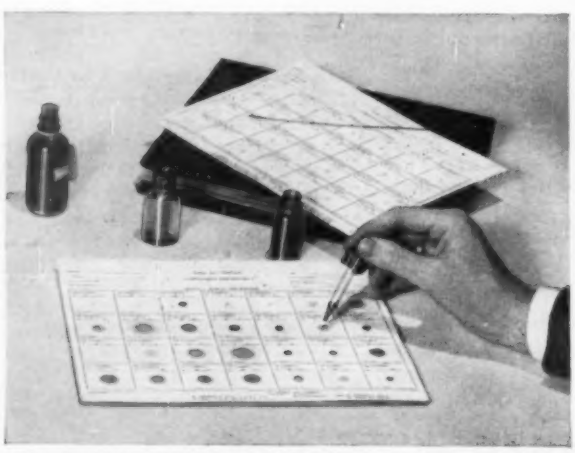
From a couple of drops of used oil, the Shell "ADC* Oilprint Analysis" provides a reliable check of oil condition, in minutes. It is very simple, and with a little practice, it tells you a lot about that oil and the engine that uses it.

What a drop of used oil shows: You place a drop of used oil on a piece of special filter paper supplied by Shell . . . let it stand a minute or two. You will then be able to *see* the following:

Water dilution: Even a tiny amount of water shows up . . . and that means not only that your oil is losing its ability to protect engine parts, but it also shows whether the water represents a normal amount of condensation or something more serious, such as an actual leakage of coolant from a faulty jacket.

Dispersancy/detergency: The same oil drop will give you a picture of how well the special additives in the oil are doing their job . . . whether or not the contaminants are being held in suspension where they do least harm . . . whether the cleansing and dispersing actions are adequate . . . whether the oil is still good.

Adulteration: The color of the oil spot will show whether too much contamination is occurring . . . and will very often point up the cause, indicating a check on



The simple test setup: sample bottles, a wire rod, a bottle of "indicator," and the permanent record card.

This single, on-the-spot sample reveals many things about an engine.

A fleet superintendent sees how easily the test is made.

injectors, nozzles, oil and air filters of diesels, or on plugs, carburetors and filters of gasoline engines.

All of the above can be learned from the single drop of oil . . . in an amazingly short time.

Alkalinity: Engine wear and engine deposits increase as the oil becomes acidic in nature due to contamination from combustion products. A special indicating fluid, developed in Shell Laboratories, tells at a glance whether oil is alkaline and still usable, or acid *and how much.*

Operators who keep an ADC Oilprint Analysis record of each vehicle generally find that the crankcase oil stands up longer than they had figured . . . a distinct saving in lubrication cost. At the same time, there is a running check on each engine that often detects impending trouble before its correction becomes costly. In this respect, the Shell ADC Oilprint Analysis qualifies definitely as one of the valuable recent tools of preventive maintenance.

If you are concerned with extending the service of crankcase oil, and with avoiding the risk of using oils loaded with contaminants, we suggest that you have one of the Shell service engineers demonstrate ADC Oilprint Analysis for you.

*Trademark

Photo shows an oil-spot test card...one phase in the visual life record of a charge of oil.

The Shell "indicator" shows acidity instantly. If spot turns red, oil is no longer fit to use, should be changed quickly.

SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

. . . for more details circle 250, page 16

S & M Construction Company, Providence, R. I., uses 12 of these Mack LJSWX diesel dumpers under 2-yard Lorain shovel in excavating peat bog near Atholl, Mass., on a by-pass for U. S. Route 20.

ONLY A SPECIALIST NEED APPLY...

. . . For only Macks can get in and out of mud like this under their own power!

Axle deep in soft, soupy mire and hauling a full load of heavy peat bog, 80% water, this Mack dumper will pull out of the muck and be on its way . . . and back again on schedule.

It's Mack's famous Balanced Bogie, along with Mack's exclusive Power Divider, that makes seemingly impossible tasks like this everyday assignments for Macks. This wonder-working team delivers torque to each wheel in proportion to its traction. In addition, it assures uniform tire loading and braking on all four rear wheels, and maximum stability under any terrain or road conditions.

When you add the Balanced Bogie and Power Divider to Mack's rugged construction, ease of maintenance, and economy of operation, you'll see why Macks are the most versatile trucks, the biggest money makers in the construction industries today. See your Mack Branch or Distributor for complete details. Mack Trucks, Inc., Plainfield, New Jersey.

MACK . . . *first name for trucks*

. . . for more details circle 236, page 16

New Publications

(Continued from p. 107)

Soil-cement reference

Soil-Cement Construction Handbook, and PCA Soil Primer. Revised editions of both publications have been published by the Portland Cement Association. New information is included based on recent research in soil science and soil-cement construction methods.

The Soil-Cement Construction Handbook gives practical procedures for building a soil-cement base course under various soil and topographical conditions. It includes supplementary information on inspection and field control and a resume of soil surveying, sampling and laboratory testing.

The PCA Soil Primer contains basic information on soil and its influence on the design, construction and performance of pavements. It serves as a good introduction to soil science for highway engineers.

Single copies of these two booklets are available free in the United States and Canada from the Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill.

AMERICAN CIVIL ENGINEERING PRACTICE, Volume 1 and 2, price $15.00, each. John Wiley and Sons, Inc., 440—4th Avenue, New York 16. N.Y. These voluminous volumes with chapters by many distinguished authors present the fundamental principles, procedures and data of modern civil engineering practice in concise form for reference, with illustrations from current practice. The volumes replace the American Civil Engineers' Handbook first published in 1910 by Professor Merriman. Recommended as important new source material for civil engineers.

PARKING GUIDE FOR CITIES. Published by the Bureau of Public Roads, this illustrated 172-page bulletin is on sale at Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C., at 55c a copy. Do not send orders to the Bureau.

The Guide analyzes each of the elements of the parking problem as it exists today in various cities, and indicates practical solutions found workable by experience. Chapters describe the nature of various types of parking studies, and present a large fund of statistical information on parking and travel habits in central business districts, obtained through comprehensive studios in over 100 cities and 15 states.

Some recent users of Seismic Surveys

- Dam site investigation.....Westminster, Mass.
- Building sites, Penn. State Univ.....State College, Pa.
- Bridge Site .....Connecticut River, Hartford, Conn.
- Super highway.....Berkshire Extens. N. Y. State Thruway
- Dam site exploration.....Delaware River
- Bridge site.....Newburgh-Beacon Bridge, Hudson River
- Aguado Anasco Hwy., & Guajataca Bridge.....Puerto Rico
- Water supply.....Water Resources Authority, Puerto Rico
- Dam site .....Dover, New Jersey
- Hurricane Barrier.....Narragansett Bay, R. I.
- Quarry exploration .....Massachusetts
- Generating plant expansion site.....Staten Isl., N. Y.
- Housing development site.....Trumbull. Conn.

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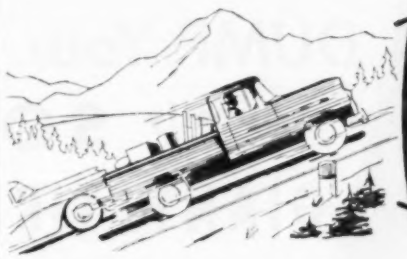

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. . . For more details circle 266, page 16

FLEXIBLE CULVERTS UNDER HIGH FILLS. Bulletin 125, Highway Research Board, 2101 Constitution Avenue, Washington, D. C. Price $3.30.

This bulletin contains four detailed papers, representing the latest experience with actual installations of corrugated plate pipe structures under fills of varying heights, together with analytical studies. The four papers are published as part of the work of the Committee on Culverts and Culvert Pipe, M. G. Spangler, Chairman, Highway Research Board.

PROCEEDINGS 17TH ANNUAL HIGHWAY ENGINEERING CONFERENCE, March 6-8, 1956, available on request as Bulletin 80, Utah Engineering Experiment Station, Department of Civil Engineering, University of Utah, Salt Lake City, Utah.

AUTOMOBILE FACTS AND FIGURES, 36TH EDITION (1956). 80-page book of tables, charts and other data on the automotive and related industries available on request to the Automobile Manufacturers Association, New Center Building, Detroit, Michigan.

Reimbursement of Utilities for Relocation of Facilities Along Highways. A report by the Research Department of the National Highway Users Conference, Inc., 966 National Press Building, Washington 4, D. C.

NIGHT VISIBILITY, 1955. Bulletin #27, The Highway Research Board, 2101 Constitution Avenue, Washington, D. C., includes papers presented at the 34th annual board meeting on sign brightness and legibility, brightness of rear lights on trucks and similar subjects of interest to highway designers, planners and traffic safety men.

CULVERT-FLOW CHARACTERISTICS. Bulletin 126, comprising two recent papers on the subject. (1) "Demonstration of Possible Flow Conditions in a Culvert," by M. R. Carstens and A. R. Holt and (2) "Tests on Circular-Pipe-Culvert Inlets," by R. E. Schiller, Jr. Available price $0.60 at the Highway Research Board, 2101 Constitution Avenue, Washington, D. C.

PROCEEDINGS, EIGHTH CALIFORNIA STREET AND HIGHWAY CONFERENCE (January 1956). 124 pages. Contains 25 papers covering a wide range of subjects related to highway and street planning, administration, traffic and safety, engineering and construction. Available price $2.00 at University Press, Berkeley 4, California.

LOAD TRANSMISSION TEST FOR FLEXIBLE PAVING AND BASE COURSES, (Part V.) By R. C. Herner, CAA Technical Development Center. May 1956. 13 pages. 50 cents. (Order PB 121146 from OTS, U. S. Department of Commerce, Washington 25.) This fifth report in a series contains test data from the load transmission project, and summarizes all tests with single airplane tires as the loading medium and with the test pavement supported by a weak subgrade. Charts are developed for accurate prediction of the maximum subgrade reaction for a wide variety of design conditions. An accurate procedure is shown for extension of the charts to paving materials and combinations of materials differing greatly in physical characteristics and performance.

NEW LEFAX DATA BOOK: Lefax' newly revised "Engineering Formulas & Tables" contains 350 pages of basic formulas, design data, and tables. Sections include Mathematics, Measures, Materials, Gauges, Screws, Mechanics, Electricity and Magnetism, Hydraulics, Structural Data, Reinforced Concrete, Pipe and Fittings, Steam Tables, and Mathematical Tables. Price $2.75. For Catalog giving 2000 listings write Lefax Publishers, Phila., 7, Pa.

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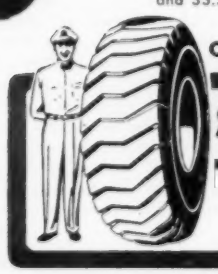

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"Ahead of schedule"

on 8-mile farm-road job says Texas contractor

Pennington's busy C Tournapulls pass on haul road. Fill area is beyond last scraper. Ability of these earthmovers to work at constant high speeds helped complete farm-road 1093 job ahead of schedule.

"Our 4 'C's' put us ahead of schedule on this job", stated C. E. "Tip" Heatherly, general superintendent for Contractor Dan Pennington, Grapeland, Texas. He was talking about an 8-mi. construction job on farm-road 1093, north of Eagle Lake, Texas, which the firm handled with its Tournapulls.

"These 'C's' work good in anything," Heatherly said. "I like their maneuverability — the way they get in and out of tough spots."

'Pulls handle 90% of yardage

Pennington used a scraper line-up of 4 LeTourneau-Westinghouse C Tournapulls and 1 crawler-with-pan for the 9-month job. The four "C's" (16 yds. heaped capacity) did 90% of the dirtmoving. The two-lane highway was bid jointly by Dan Pennington of Grapeland, Texas and H. Ratliff of Rogers, Texas, in the amount of $442,515, with Mr. Ratliff doing the concrete and Pennington doing the dirt, base and asphalt. Close to 250,000 yards of material had to be moved in the course of road construction.

Loads in wet sand

When work started, machines worked in sand, wet down by heavy rains. Cut was 800′ in length.

Heaping loads of wet sand boiled into bowls of "C's" during road construction near Eagle Lake, Texas. Frequent rains failed to slow scraper production on this winter job.

"Pulls" spread fast in sand. Operators had no trouble in slippery footing. Rig's 90° power-turn and power-transfer differential aided maneuvering when sand was wet.

New C Fullpak even better!

The same dependable performance in rough going can be yours on your next job. For even *better* production, ask about the new 18-cu. yd. C Fullpak Scraper. This high-production "Fullpak" loads fast, boils easy, heaps a big load every time!

Tournapulls hauled an average 1100′ over spongy-footing...spread fast over 70′ distance. Cycle distance averaged 2668′.

Tournapull cycle-time was 5.85 min. Other averages were — 1.14 for loading, 2.07 for hauling, 0.44 for spreading, and 2.20 for return. Each machine moved 10 loads an hour. All scrapers worked a 10-hr. day, 5½ days per week.

W. F. Kitchens, Jr., a Pennington operator, said: "I've been running Tournapulls since 1951, and I like the C Tournapull fine — mostly because it's so easy on me."

Tournapull—Trademark Reg. U.S. Pat. Off.
Fullpak—Trademark CP-1054-H-b

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A Subsidiary of Westinghouse Air Brake Company

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... for more details circle 227, page 16

The Alcan test run was supervised and certified by the AAA.

Never-say-die dependability proved

NEW TASK•FORCE 57

Six new '57 Chevy trucks tamed the rugged
Alcan Highway in one round-the-clock sprint.
They covered the grueling run in less
than 45 hours (normally a 72-hour run)!

Up towering grades, through washouts, blinding dust and pounding gravel—these heavily loaded Task-Force huskies took everything the Alcan could dish out, and still they trimmed almost 30 hours off the normal running time! As a special test, two of the engines were not stopped once during the entire trip. Gas mileage ranged up to 18.17 miles per gallon! A Powermatic-equipped heavyweight went all the way in a single forward-speed range! "Despite the severity of the test under the most adverse road conditions," states the official AAA report, "not a single truck turned back or dropped out due to mechanical failure." Put an Alcan-proved Chevrolet truck to work on your job! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

on the Alcan Highway!

CHEVROLET TRUCKS

NO JOB TOO TOUGH FOR THE ALCAN CHAMPS! Whether your job calls for fast-working efficiency against tight schedules or big muscles for off-the-road grinds—there's an Alcan-proved Chevrolet Task-Force truck ready to save you time and money!

DROP BY YOUR CHEVROLET DEALER'S SOON. Look over his new Task-Force line for '57. You'll spot the modern features that put new Chevy trucks way out in front. You'll see right off why they're first choice with most truck buyers!

PROVED ON THE ALCAN HIGHWAY . . . CHAMPS OF EVERY WEIGHT CLASS! CHEVROLET

. . . for more details circle 280, page 16

Geology in Highway Design and Construction

Better and more economic road design, and more accurate and closer bidding by grading contractors -- this is the two-fold result obtained by the Kansas Highway Commission in making systematic use of geologic data.

THE use of geology in highway design may be no innovation in many states, but the furnishing of geologic information to bidders on a grading job is quite out of the ordinary. The Kansas highway department has been practicing this procedure successfully for many years. It has found the practice worth while because grading contractors can bid more confidently and therefore more closely when they know accurately the materials and conditions they will encounter.

If the contractor is not furnished any information about the nature of the material to be moved — or if sad experience has taught him to distrust the furnished information — he must add a large factor to his estimate to cover any contingency that may arise. However, if he knows that the preliminary classification of excavation furnished to him will prove to be accurate, he can reduce his contingency buffer. As the contractor realizes that the quantities and materials excavated turn out to be as shown on the plans, his confidence grows and his prices come down.

● *"Rock" Better Defined.* Classification of excavation is one of the important functions of the Kansas highway department geologists. A criterion often used for the classification of material as rock excavation is that it requires continuous drilling and blasting. Sometimes the classification "loose rock" is used. But what is loose rock? Is it a deposit that only occasionally requires drilling and blasting, or is it excavated material that has only a few boulders (12 in. to 18 in. size) strewn throughout the mass? A classification for rock excavation based on drilling and blasting requirements often functions unfairly in favor of the poorly equipped contractor who may use and be paid for continuous drilling and blasting in material that another better equipped contractor would move without hardship.

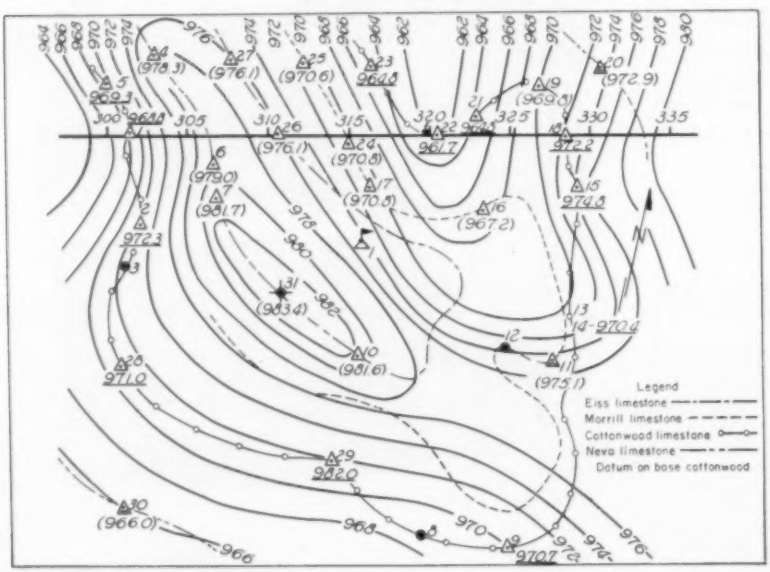
Kansas geologists besides making preliminary geologic surveys for use in design, also make final decisions on classifications of material for payment. They have defined rock excavation in the standard specifications in part as follows:

"Rock excavation shall include all firm, unaltered and unweathered cherty limestones, shaly limestones, sandy limestones, earthy and impure limestones, dolomitic limestones, and all other limestones including chalk beds and gypsum beds; all firm and unweathered and unaltered argillaceous, arenaceous, calcareous, and carbonaceous shales, sandstone, cemented conglomerates, and mortar beds . . ."

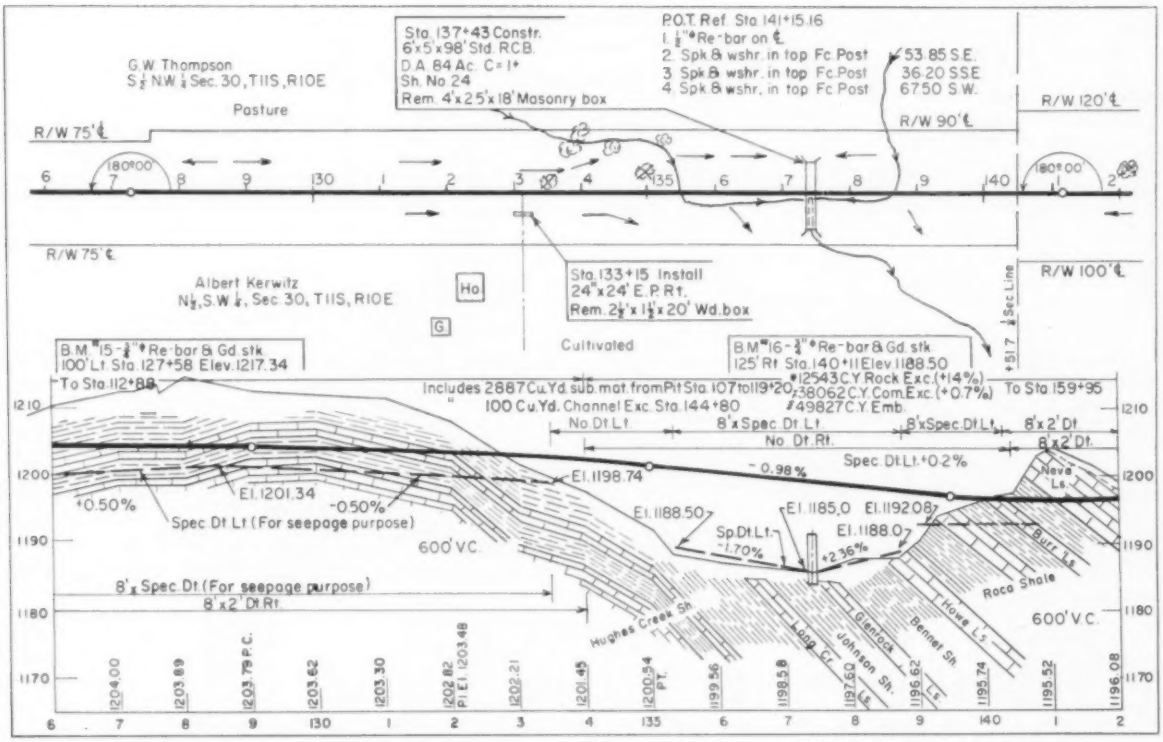
This definition has helped to erase the inequities of the old system. It has promoted the use of better equipment and construction methods. And the definition seems to have been legally advantageous, inasmuch as no lawsuits have arisen under it, whereas suits were common under the old definition.

The Kansas system of material classification is based, as noted above, entirely on the geologic type and condition of each material. The preliminary classification as to rock excavation or common excavation is made by the field geologist. Final quantities seldom differ by more than 3 to 5 percent from the preliminary figures — another inducement to closer bidding.

● *Geology Applied to Design.* Geology is not generally the major factor in highway location. High-volume, high-speed traffic demands the most economical, practical route between origin and destination. Where alternate



● **Figure 1. Topographic map of the top surface of a limestone bed used as a datum reference.**



● Figure 2. Clarified typical plan and profile sheet showing the geologic information, culture, grade line, subdrainage, and construction requirements of a section of road.

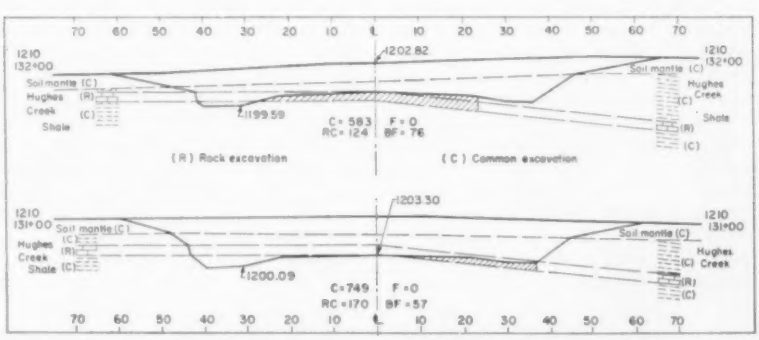
routes are equally suitable, however, preliminary geologic survey can provide the data for quite accurate estimates of the problems, quantities, and costs involved for each route. A decision based on economics is then possible.

Geologic Investigation

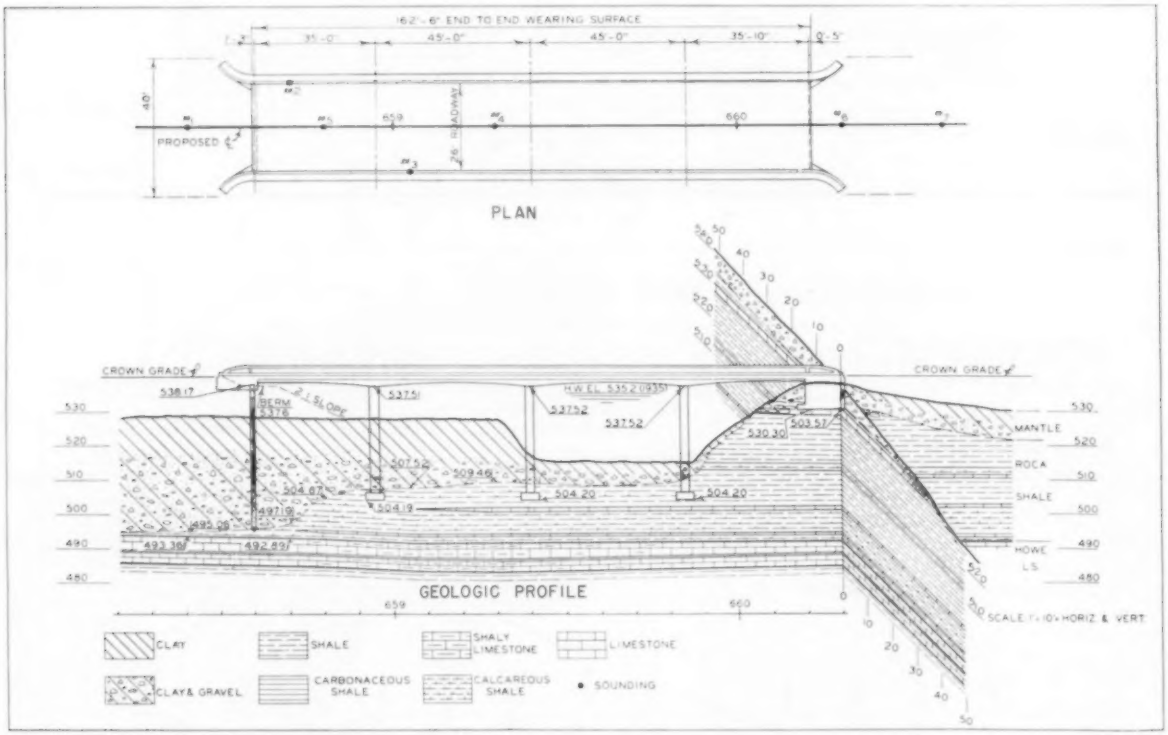
The first step in the geologic investigation is a thorough reconnaissance of the project and of the surrounding area. The geologist may range as far as 20 miles from centerline to determine the characteristics of a particular bed which he knews will occur on the project. Since most of the sedimentary formations in Kansas retain their characteristics over considerable distances, the practice gives excellent results. The area for about one-half mile on each side of the centerline is studied in detail. In this area all outcrops are noted and the various rock formations are measured and described. Seepage conditions are noted and correlated with the stratigraphy (stratification conditions) and special attention is given for each formation to its weathering characteristics, erodability, slope stability, jointing and all other physical characteristics of engineering significance.

This method of attack has been successful in Kansas because of the fairly uniform geological characteristics found within given strata. With few unimportant exceptions the bedrock in Kansas consists of sedimentary rocks, generally alternating thin limestones and shales, except for the massive sandstones and shales of the Cretaceous Dakota formation. The limestones range in thickness from a few inches up to about 60 ft., while shales seldom exceed 100 ft. in thickness and generally average less than 25 ft. For the most part these sedimentary beds are rather flat, lying with an average northwesterly dip of about 12 ft. to the mile. Locally the dip increases or reverses but it rarely exceeds 100 ft. per mile.

● *Preparing Contour Map.* Having satisfied himself as to the geologic factors of the area which will influence any phase of the engineering of the project, the geologist starts his second step — the structural contour map. Figure 1 illustrates a completed map. It was prepared by taking elevations, generally with plane table and alidade, of all exposures of recognizable tops and bases on the exposed limestones in the area. It gives the same picture that could be obtained by preparing a topographic map of the surface of a selected lime-



● Figure 3. Clarified typical cross-section sheet showing geologic information.



● Figure 4. Typical clarified engineering geology bridge sheet of the Kansas state highway commission.

stone bed if all of the overburden were first stripped away.

The third step is a projection from this map to a centerline profile of the limestone formation used as a datum for the map. The stratigraphy above and below this key bed is then filled in, using measured intervals determined during reconnaissance, to complete a field or trial profile.

The field profile is only a roughly accurate presentation of the geology of the project. The accuracy is theoretically plus or minus one-half of the contour interval which is usually 5 ft. Further refinement and correction of the field profile is made by strategically placed borings, for which both hand and power drilling equipment is used. The field profile is the key to the success of the Kansas method. It is the tool which eliminates the inaccuracies which so frequently occur when uncorrelated soundings or borings are used. That word "uncorrelated" here has tremendous significance.

According to Mr. John D. McNeal, chief geologist, Kansas state highway commission, "The field geologist knows what the subsurface stratigraphy is at any spot on the proposed centerline; he makes the soundings to prove that what he knows is correct." Therefore, instead of making soundings at regular 100 ft. stations on the centerline, he makes only those soundings that are necessary to correlate the topography and stratification of the surface and subsurface with the adopted limestone datum plane, or to discover any lenses or local structural anomalies that might not conform to the known stratigraphy and structure.

Cross Section Sheets

Profile and Cross-Section Sheets. When the field profile has been proved and improved by the necessary borings, all of the field notes are taken to the drafting room for the fourth step — final interpretation and drafting. The end result is a set of engineering plans on which the complete geologic pattern is shown both on the centerline profile and on every cross-section. Figures 2 and 3 are examples. These figures (slightly modified from the Kansas standard plans for purposes of reproduction and clarity) show the information that is furnished not only to the designer but to the contractor as well, for the interpreted geologic data are shown on the bidding plans.

● *Uses of Geologic Approach.* Figure 2 will serve to illustrate how uncorrelated soundings may be misleading. Note the thin limestone in the Hughes Creek shale between stations 126 and 133. Blind soundings would have been stopped by this limestone with the result that all of the material beneath the top of this stratum would have been considered as rock excavation and would have been paid for as such under the old definition. Actually, in this example, the underlying shale is relatively soft and would, under Kansas specifications, be classed and paid for as common excavation. The price differential between these two classes may be as much as 50 cents a yard, or more. This example illustrates the erroneous picture that can be developed by soundings alone. After the first cut was opened the lower shale would have been given a final classification of common excavation. Thus there would have developed an under-run in the quantity of rock, and some form of restraint might have been needed to hold the contractor's wrath in check. Similarly, soundings at stations 139 and 140, would have missed both the Burr limestone and the limestone in the Roca shale and would have been virtually worthless for design purposes.

● *Bridge Sites.* The methods outlined above are equally useful in obtaining foundation information for bridges. The end product, an engineering geology bridge sheet which is also included in the bidding plans, is seen in Figure 4. Use of geologic principles to extend the information obtained from a single sounding can produce large savings. During the investigation of foundations for structures on

the new Kansas Turnpike the use of these methods kept the cost of foundation studies to less than $250 per structure. In one example where the turnpike crosses the Kansas River Valley, nine structures including one 1,800-ft. bridge are being built within the valley limits. An adequate picture of the footing conditions for all nine structures was obtained from a total of 16 soundings by correlating all sounding data with the geology of the area. With the detailed, three-dimensional picture of the geology of an area, the designer has much of the needed information. Throughout the preliminary investigation the geologist's aim has been not only to determine the geology but to *interpret* it in terms of its engineering application. The final step in the survey, then is to prepare an engineering geology report. In this report, the general geology of the area is described along with the engineering characteristics of each geologic strata encountered. From this information, specific design recommendations are made. These may be in the form of general remarks, or may include actual detailing of the recommended design.

Design Considerations

What are some of the design considerations which the geologist may include? The ones found of most importance for Kansas highways may be listed as follows:

A. Road Design

1. Alignment. This includes the use of geology in highway location.
2. Geometric design including determination of the most economical grade and cross-section.
3. Determination of balance points through better estimates of bulk volume changes (shrink and swell).
4. Classification of excavation for pay purposes and for use.
5. Fill foundation treatments.
6. Control of seeps, springs and subgrade moisture.
7. Selection of stable backslopes and erosion control in both ditches and backslopes.
8. Overbreakage.
9. Surface drainage control.

B. Bridge Design

1. Selection of foundation type.
2. Selection of footing elevations and loadings.
3. Selection of most economical span lengths as determined by the foundation requirements.
4. Control or prevention of scour.
5. The ground water problem.
6. Stream stability.
7. Abutment type and design.
8. Channel changes.

Nothing has been said here about the detailed subdrainage studies and plans submitted. A separate article could be written on this phase. Suffice it to say that subdrainage recommendations are shown on the geologic profile and explained in detail in the final report for a project.

● *In Conclusion.* In Kansas, the use of geology in highway design has proved to be an economic necessity. The highway geologist is involved constantly with problems of construction, maintenance, right-of-way, legal, soils, research and materials and with special problems.

This review was prepared from conferences with Walter Johnson, Chief engineer; John D. McNeal, chief geologist; R. L. Peyton, engineer of research; and others in the Kansas state highway staff.

Seelye on foundations

Elwyn E. Seelye's "Foundations: Design and Practice," 494 pp. Price $16.00. John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y.

A five-dimensional work, this book covers all phases of design, design data and criteria, costs, specifications, and field practice. More than forty years of foundation and structural engineering experience enable Mr. Seelye to gauge the working needs of the builder, inspector, architect, and design engineer, and to supply the exacting details they require.

For their ready reference, "foundations" is organized along four lines: (1) "push-button" design of simple elements such as plate footings and retaining walls. (2) More complex designs and consideration of various allied problems, such as combined footings on problems of settlement. (3) A study of the economics involved, enabling the engineer to choose between various types of structures. Elaboration on a wide variety of structural types, ranging from a concrete building foundation to a bridge abutment, and from an embankment to a paving base.

The field problems are presented in juxtaposition to the corresponding design information, adding to the design engineer's basic understanding. On the other hand, field practice which covers such points as an inspector's checking list, is placed in a separate chapter.

Among the many side subjects entering Mr. Seelye's picture are waterproofing, underpinning, pavement foundations, frost data, building code practice, earthquake design, and red light warnings throughout the text. Hundreds of scrupulously worked out drawings not only accompany the text but provide a medium of study in themselves.

Author of the well-known three-volume work, "Data Book for Civil Engineers," Mr. Seelye is senior partner in Seelye Stevenson Value and Knecht, Consulting Engineers. "Foundations: Design and Practice" contains 494 pages and is priced at $16.00.

Know them? ARBA committee on traffic signs

● **The American Road Builders' Association's important Technical Committee on Traffic Signs, under the chairmanship of Armand E. Keeley, president, Prismo Safety Corporation, Huntingdon, Pa., met in Washington recently. Shown seated here are John Brady, AGA Division, Elastic Stop Nut Corp.; Helen McLaughlin, ARBA staff; Mr. Keeley; Burton F. Miller, ARBA deputy exec. V.P.; S. S. Adams, S. G. Adams Co.; John E. Wiley, managing director, ARBA Materials and Supplies Div.; C. E. Searight, Cataphote Corp.; and Melvin R. Schuster, Alcoa. Standing: James Beard, Flex-O-Lite Manufacturing Corp.; Preston D. Law, Flex-O-Lite; W. E. Miles, Grote Manufacturing Co.; J. B. Rhodes, Elastic Stop Nut; Maj. Gen. Louis W. Prentiss (USA ret), ARBA executive vice president; and C. A. Clarke, Miro-Flex Company.**

What's New
in Equipment and Materials

Reader Service Coupon on Page 16

Clark Has New Equipment Line of Scrapers and Dozers

A new line of road building and earth moving equipment, announced by Clark Equipment Company's Construction Machinery Division, Benton Harbor, Mich., will be shown publicly for the first time at the American Road Builders' Show in Chicago, Ill., Jan. 28-Feb. 2, 1957.

The new equipment includes a line of tractor scrapers and tractor dozers, as well as major additions to the present line of Michigan tractor shovels.

The new items of equipment utilize the same basic design of matched power shift transmissions, torque converters and planetary—wheel axles developed by Clark Equipment Co., for the Michigan tractor shovels, which went into production in May, 1954.

Tractor scrapers in three capacities designed to meet specialized requirements of all highway construction projects will be produced by Clark. They are: Model 110, with 8-10½ yd. capacity; Model 210, 12.7-18 yd. and Model 310, 20-27 yd. Engines are 165, 210 and 335 hp. respectively.

Clark torque converters multiplying torque as much as three times engine output are standard equipment. Together with Clark four-speed power shift transmissions, Clark planetary-wheel axles with locking differentials, the torque converters are stated to provide the precise amount of power required under all kinds of operating conditions.

Top speed of the "Michigan" Scrapers is over 30 mph. Full power steering includes automatic two-speed control as standard equipment: Low steering ratio which prevents oversteer at high travel speeds moves into a faster-acting, high ration for maximum maneuverability at low speeds, all without requiring the operator to turn a switch or push a button.

Full 90-degree steering in either direction is provided. The 8-10½-yd. "Michigan" Model 110 tractor scraper will make a 180-degree turn on a 30-ft. roadbed.

Power-to-weight ratios are among the industries highest and contribute to high output per hour of running time.

For fast, precision control all "Michigan" Scraper controls are full hydraulic.

Bowls of the "Michigan" scrapers are of open top design with no obstruction to interfere with quick tractor shovel loading. Sides are low to facilitate rapid loading and increase stability of the machines.

Double-acting hydraulic cylinders provide positive forward ejection and fast return plus precise control over spreading. Both blade and apron hydraulic circuits are independent, permitting either to be lowered even with the engine stopped.

A new 6-cu. capacity "Michigan" tractor shovel has been developed by Clark to provide low cost high speed loading of 20 to 25 yd. hauling units. To be known as the Model 375A, the new tractor shovel will weigh in excess of 50,000 lb., and will be equipped with a Cummins turbo-charged 335 hp. diesel engine.

A second new tractor shovel also will be shown by Clark at the American Road Builders' Show. It will have a capacity of 4 cu. yd. and will be known as the "Michigan" Model 275A.

Michigan 375A Tractor Shovel

The Model 375A will lift 30,000 lb. while stationary and carry 15,000 lb. at 4 mph. The Model 275A lifts a 22,000 lb. static load and carries 11,000 lb. at 4 mph. Each machine has four speeds forward and four speeds reverse, and a top road speed of 28 mph.

Both of the new machines have the same basic Clark power train that has proven so successful on the more than 5,000 "Michigan" tractor shovels now in service.

Full power shift with two fingertip control levers on steering column is standard equipment on the Models 275A and 375A. Matched torque converters multiplying engine output as much as three times, planetary-wheel axles, and all-wheel drive combine to provide precise amounts of power for maximum traction under all ground conditions.

Rear wheel power steering for better maneuverability is another standard feature of the new "Michigan" tractor shovels. Air brakes on all four wheels are standard equipment. Boom and bucket controls are hydraulic. Two big double-acting hydraulic boom cylinders provide ample lifting power and the two new models have the "Michigan" breakout provided by two big double-acting bucket cylinders.

Two new rubber-tire tractor dozers will be added to the "Michigan" line, making a total of three machines in capacities matched to the line of tractor scrapers.

The new models are the Model 280, a 38,000 lb. vehicle with 11 ft. 3 in. blade; and Model 380, a 55,000 lb. machine with a 13 ft. 3 in. blade.

The new machines have the Clark power train, with power-shift transmission, torque converter and planetary-wheel drive axle, interchangeable with the corresponding Model 210 and 310 scrapers. Heavy duty Cummins turbo-charged diesels give the two new models the matched horsepower needed to push-load the new 18 yd. and 27 yd. "Michigan" scrapers. For really high speed back-up, each model has a top of 28 mph. in reverse. For high speed travel around the job high forward is also 28 mph.

Model 110 Michigan Tractor Scraper and Model 180 Tractor Dozer

Hydraulic controls on the new tractor dozers provide positive downpressure for heavy dozing. The blade also can be tilted by operator by means of a double-acting tilt cylinder to pry loose rocks or stumps. Both ends of the blade are fitted with replaceable side cutting edges which enable the tractor dozers to slice through heavy roots, preparatory to knocking over trees. End bits are interchangeable end for end for longer service.

Rear wheel power steering permits turns while dozing with no loss of power or load—rear wheel steering greatly increases tire life. Big air brakes are standard on all four wheels for fast, safe stopping.

For more information circle 105 on Service Coupon Page 16 and mail now.

Small Hydraulic Trencher

A new "Dutch-A-Line" hydraulic trencher stated to dig a 2 in. x 20 in. deep trench up to 400 ft. per hour, dependent on soil type, is being marketed by M & W Iron Works Co., Inc., 1928 N. Topeka Ave., Topeka, Kan.

The entire mechanism is mounted on crawler tracks driven hydraulically. The self-tightening digging chain is also

"Dutch-A-Line" Trencher

hydraulically driven and is designed to discharge debris without breaking the digging chain. The new unit is driven by a 6 hp gasoline engine with a reduction gear and hydraulic drive.

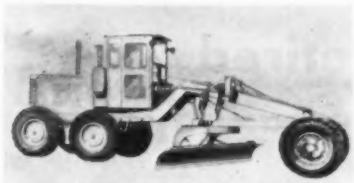
It's length is 83 in., height is 42 in. and width is 27 in.; its shipping weight is 425 lb.

For more information circle 106 on Service Coupon Page 16 and mail now.

Moldboard Shock

A new product, the Hi-Speed" moldboard shock, has been developed by Over-Lowe Co., Department A7, P. O. Box 2879, Denver 1, Colo. It fits most standard graders and through a resultant "floating blade" is claimed to enable the grader operator to maintain road speeds up to 12 miles per hour.

A further advantage claimed for the moldboard shock is the almost elimination of high speed grader bounce, since operators no longer have to "fight the controls."

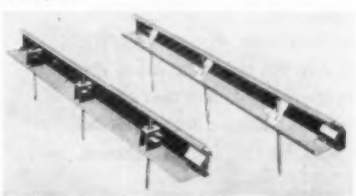


Grader Equipped with "Hi-Speed" Moldboard Shocks

For more information circle 107 on Service Coupon Page 16 and mail now.

General Purpose Road Forms

A new line of general purpose road forms, designed for fast handling, maximum durability and low cost has been announced by General Road Machines, Inc., Niles, O.



New Line General Purpose Road Forms

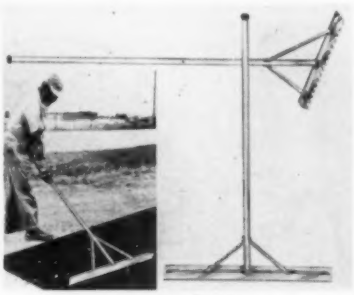
Available in both single and double wedge lock types, General road forms feature special alloy steel construction, electro-welded for extra strength and long service life, the manufacturer says.

Tapered sliding lock joint connections are reputed to assure quick positive alignment. Lock joint connections also reinforce form treads at joints and are said to prevent tread distortion, even under heavy loads imposed by modern road building machinery.

For more information circle 108 on Service Coupon Page 16 and mail now.

Combination Lute and Rake

An all-aluminum Lute-O-Rake placed on the market by Miller Spreader Corp., 4020 Simon Road, Youngstown, O., is a light-weight combination of both lute and rake. One edge of the T shaped extruded aluminum blade is straight while the other has teeth like a rake. Two models are available: one with both blade edges straight for luting, another with one plain edge and one rake edge. Handles come in two easy-working lengths: 7 and 10 ft. Blades are offered in two widths: 30 and 36 in.



Lute-O-Rake

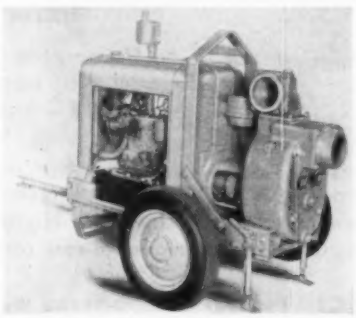
For more information circle 109 on Service Coupon Page 16 and mail now.

Contractor's Pump

A new 6 in. Model 90-M contractors' pump announced by the Pump Division, Construction Machinery Co., Waterloo, Ia., features increased performance and decreased size and weight.

The pump features dual volute priming action which assures fully automatic priming. A top entrance suction connection is provided for dependability and water ways of the pump will easily pass a 2-in. solid sphere. The machine is powered by the radiator cooled 244 cu. in. Continental engine, which develops a constant 55 hp at 1800 rpm. Safety controls automatically shut off the unit in case of high engine temperature or low oil pressure.

The pump is available with either skids, steel wheels, or 550 x 16 in. pneumatic-tired wheels.



Model 90-M Contractor's Pump

For more information circle 110 on Service Coupon Page 16 and mail now.

3½-Tilt Type Mixer

A 3½-S tilt type unit, called the "Dandie Junior," has been added to the concrete mixer line of Kwik-Mix Co., Port Washington, Wis., a subsidiary of Koehring

"Dandie Junior" Mixer

Co., Milwaukee, Wis. The new mixer is of rugged, lightweight construction and complies with all AGC specifications, including a capacity rating of 3½-cu. ft. of mixed materials plus 10% overload. The mixer is powered by a standard make 2.2 hp air-cooled gasoline engine, or optional electric motor, with single V-belt power transmission.

Carefully designed and well made, the Dandie Junior has many features that contribute to ease in handling and operation for long life and low maintenance.

For more information circle 111 on Service Coupon Page 16 and mail now.

Digging Depth of Trenchliner Increased

An increase in digging capacity to 10-ft. depth for the Model 155 general utility Trenchliner has been announced by Parsons Co., Newton, Ia., a subsidiary of Koehring Co., Milwaukee. The change does not affect the 155 Trenchliner's range of digging widths of 16 through 26-in.

The 25% increase in digging depth adds an important factor to the all-around heavy-duty performance of the ladder-type Trenchliner in general utility work. Compact in design, with a 7-ft. 4-in. height and 5-ft. 4-in. width, the 155 can operate in congested areas. In addition, low center of gravity and low ground bearing pressure are added characteristics of Parsons 155 Trenchliner.

(Continued on page 127)

THE RECORD FROM TENNESSEE PROVES THAT...

Concrete Roads Aren't Retired

...they are kept at work for the taxpayers

This is U. S. Highway 64 near Somerville, Tenn. —a concrete road built in 1929. Now 27 years old, it's still on the job! This long service is typical of the durability of hundreds of miles of concrete roads in Tennessee. Here's the record:

Total mileage of concrete roads built in Tenn.	2,124
Mileage still in service (exposed or serving as the heavy-duty, load-carrying base under a thin layer of resurfacing)	2,120
Mileage more than 20 years old and still in service (exposed or resurfaced)	1,457

Look at the record in another way: Of all the concrete roads ever built in Tennessee 99.8 per cent is still serving. What's more, over two-thirds of this durable paving is more than 20 years old.

This performance is a record of low-annual-cost highway service to taxpayers in Tennessee. The future record will be even better for *engineers now can build concrete roads to last 50 years and more.*

Besides great durability, concrete roads have much lower maintenance cost and provide greater safety—night or day, wet or dry.

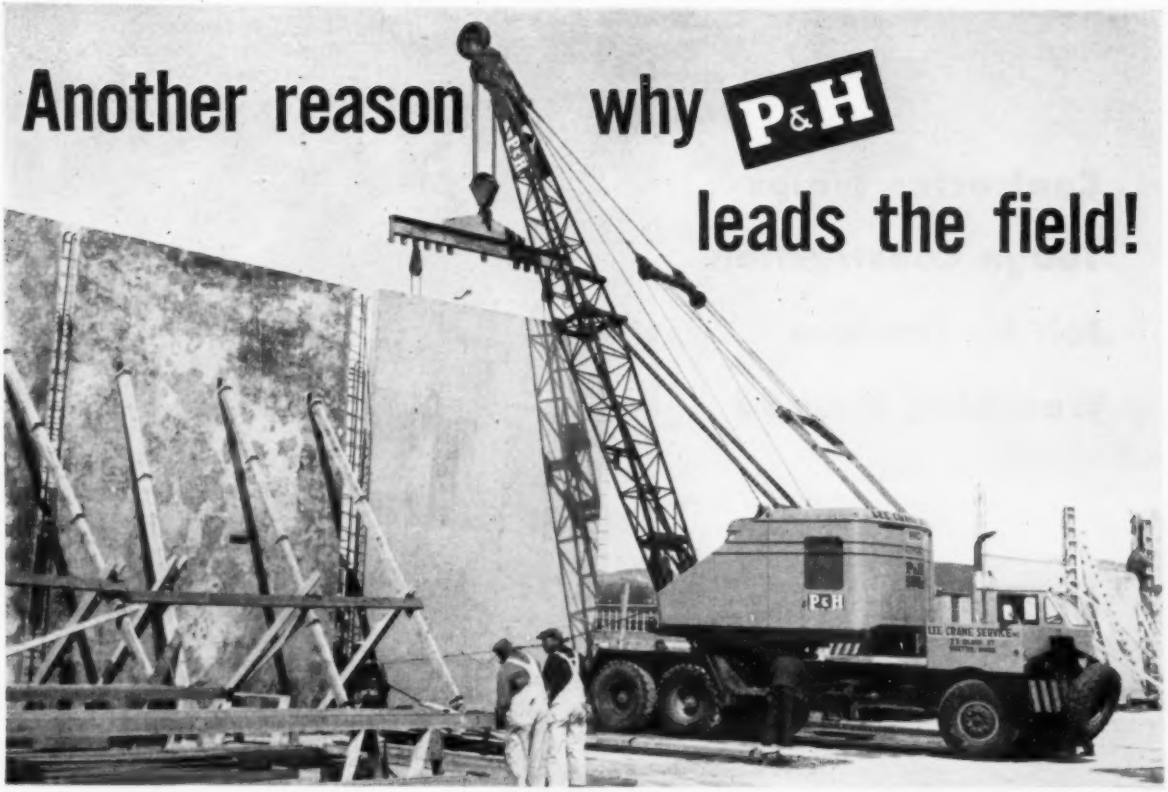
In the biggest highway construction job ever undertaken, taxpayers everywhere look to public officials and highway engineers for safe, better, longer-lasting, lower-annual-cost roads. As the record proves, concrete will fill the bill. With the federal government paying 90% of the cost of the Interstate Highway System, safe, durable, ***low-annual-cost*** concrete will be the logical choice.

PORTLAND CEMENT ASSOCIATION Dept. 12-28, 33 West Grand Avenue, Chicago 10, Illinois

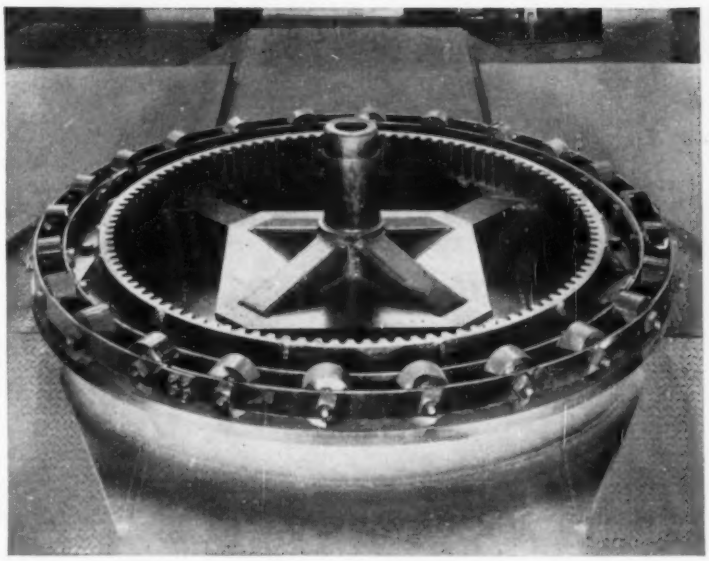
A national organization to improve and extend the uses of portland cement and concrete . . . through scientific research and engineering field work

. . . for more details circle 245, page 16

Another reason why P&H leads the field!



P&H Model 555A-TC with 35 ton capacity handles a wide range of jobs.



You'll recognize this view as one of the most important parts of the rugged P&H equipment. No other power crane or shovel offers operators a swing action that is equal to P&H in smoothness and speed. And that fast, smooth swing means more profitable production.

It's accomplished by putting the weight on the multiple rollers which, in turn distribute the weight over the entire diameter of the specially machined roller circle — just like a mammoth roller bearing. The rollers themselves carry the weight — the center pin merely acts as a guide.

Make certain you get the advantages of P&H live roller circle on your next power crane or shovel. Specify P&H.

BUILD BETTER ROADS TODAY · FOR A GREATER AMERICA · See you at the ROAD SHOW CHICAGO Jan. 28-Feb. 2, 1957 · AMERICAN ROAD BUILDERS ASSOCIATION

HARNISCHFEGER

Construction & Mining Division, Milwaukee 46, Wisconsin

. . . for more details circle 282, page 16

Contractor Whips Tough Construction Job by Tandem Trenching Method

J. A. JONES CONSTRUCTION COMPANY, of Charlotte, used two Cleveland trenchers in tandem to set the pace on a tough construction job for a gas line between Chapel Hill and Sanford, N. C. The lead trencher, a Cleveland 95, opened the initial cut to a depth of 2 feet and the second machine, a Cleveland 110, dug the final trench to finished grade, an average of 3½ feet deep. Both cuts were 18 inches wide.

Tandem trenching permits each trencher to dig at its most effective speed range—usually more than twice the speed possible when digging to maximum depth. It also eliminates wasted road time necessary when "leap frogging" two trenchers. Tandem trenching is also a big advantage on jobs where top soil must be removed and replaced intact.

J. A. Jones made the most of the superior digging ability of his Clevelands by using them in tandem on this difficult job. Boulders, rock outcroppings, and closely spaced culverts cut across the trench line every few yards but the job moved ahead at the rate of a mile a day or better—trench dug, pipe joined and laid and back filling completed.

Good Everywhere

THE CLEVELAND TRENCHER COMPANY

20100 St. Clair Avenue • Cleveland 17, Ohio

. . . for more details circle 192, page 16

Model 155 General Utility Trenchliner

Capable of producing 5.8-in. to 12.75-lin. ft. of trench per minute, the 155 Trenchliner operates with a range of 30 digging speeds selected by lever control. By changing a simple sprocket, a higher range of 30 digging speeds selected by lever control. By changing a simple sprocket, a higher range of speeds is made available to produce a maximum of 25.17-lin. ft. of trench per minute.

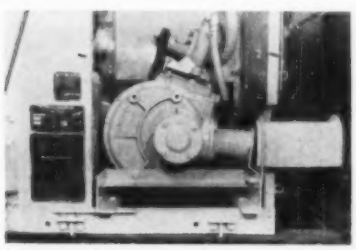
For more information circle 112 on Service Coupon Page 16 and mail now.

Front End Power Take Off for Truck Mixers

A two-speed, right angle gear drive for front power take-off and power-tower mid-transmission for its truck mixer line has been announced by Worthington Corporation, Plainfield, N. J.

The new design incorporates a pair of multiple disc clutches, running-in-oil, for two-speed operation which enables drivers to shift from drum mixing speed to agitating speed without shifting gears.

Whether stationary or declutched, the Worthington front end power take-off design permits drum motion at all times. Drum rotation is stopped by shifting the cab control to the neutral position or by utilizing the remote control on the transmission.



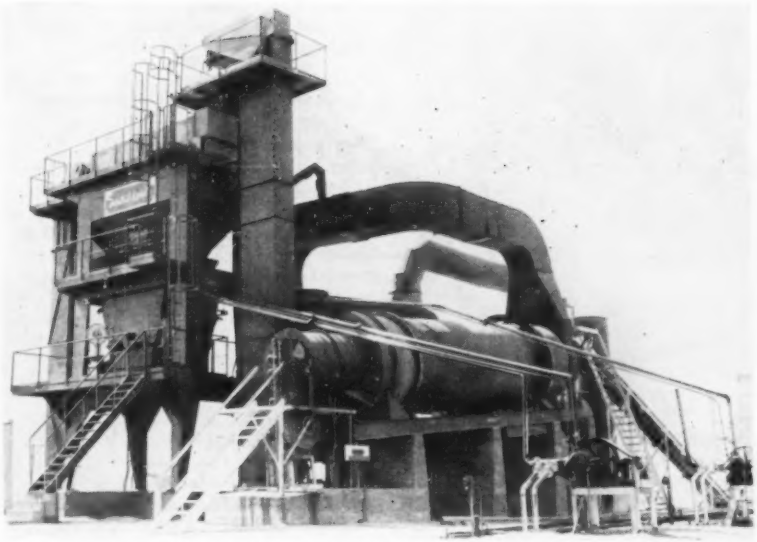
Two-speed right angle gear drive directly connected to Worthington HI-UP standard heavy duty transmission.

For more information circle 113 on Service Coupon Page 16 and mail now.

Asphalt Plants

A new line of Road-Master asphalt plants, in capacities ranging from 4,000 to 6,000 lbs, all semiportable, has been announced by Standard Steel Corporation, 5001 South Boyle Ave., Los Angeles 58, Calif.

The new Road-Master 6,000 lb capacity unit (Model R-M) has an eight foot diameter dryer. Reported tonnages with this plant are more than 240 tons per hour.



6000 lb. Capacity Road-Master Asphalt Plant

The new Road-Master plants have features such as: oversized screen, dryer and elevator; dust seals on all units; and simplified push-button controls to reduce operator fatigue.

For more information circle 114 on Service Coupon Page 16 and mail now.

Crane Has Super Boom

Baldwin-Lima-Hamilton Corporation's answer to the demand for super booms in the construction field is the new Lima Type 1250, a rugged, low-slung, air controlled machine available also as a shovel or dragline. When equipped as a crane, with a standard 60 ft. boom, it has a lifting capacity of 100 tons at a 13 ft. radius.

The crane in the illustration, equipped with a 200 ft. boom plus a 50 ft. jib, is designed to handle steel erection and concrete pouring on multi-storied apartment and business buildings up to and including 24 floors.

As a standard shovel, the 1250 is equipped with a 28 ft. boom, 22 ft. dipper handle and 3 cu. yd. bucket. As a high lift shovel, it is equipped with a 45 ft. boom, 32 ft. dipper handle and 2½ cu. yd. bucket.

Features and available equipment include: Independent propel, loading-lowering device, extra high speed hoist attachment, third drum, power reversing hoist drum, heavy duty and special light weight booms, light plants, two widths of crawlers, two lengths of crawlers, two widths of crawler treads, two types of rigid gantries, two types of folding gantries. The 1250 has a one-piece carbon steel cast rotating and truck base, fabricated steel machinery frames, machine-cut gears, telescopic boom stop with automatic shut-off, steering controlled by gear type jaw clutches, heat-treated alloy steel ground shafting and large diameter clutches and brakes.

An outstanding feature in the design permits a knock-down for haulage into units of less than 60,000 lbs. Counterweight segments are readily removable. The gantry may be folded to a height of 12 ft. 7¾-in.

Information about the new machine can be obtained from Baldwin-Lima-Hamilton Corporation, Construction Equipment Division, Lima, O.

Type 1250 Equipped with 200 ft. Boom and 50 ft. Jib

For more information circle 115 on Service Coupon Page 16 and mail now.

Power Roller Uses Vibration

A new power roller weighing 1⅛ tons and using vibration instead of static weight for compaction has been introduced by Rolcor Industries, Minneapolis 3, Minn.

The vibrating mechanism, consisting of eccentrically weighted parallel shafts 36 in. long mounted on self-aligning bearings, is stated to produce a dynamic vertical thrust of 2936 lbs. 2400 times per minute. Ground vibrations are controlled in direction and can be felt within a variable radius of 24 ft. Chassis vibration

Vibrapac Roller

has been 98% eliminated by rubber and spring mountings.

Named the Vibrapac, it is stated that densities of 105 on sand fills and 136.8 on high-type hot mix asphalt are easily accomplished.

For more information circle 116 on Service Coupon Page 16 and mail now.

Rock Drill Has Centralized Controls

A high capacity mining and tunneling rock drill, the "Lion" and an automatically-retracted semi-integral pusher leg designed for simplified one-hand operation has been announced by Atlas Capco AB.

Controls for operating both the drill and the semi-integral pneumatic pusher are located on the Lion's back head. Opening the throttle simultaneously feeds air to the pusher to raise the drill, applies the flushing water and starts impact and rotation actions.

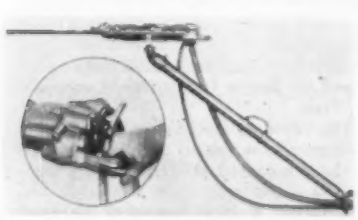
The new drill's centralized controls are stated to enable miners to make air-powered set-ups, reducing shut-down time during changes of drill steels, drill relocation and other routine activities.

Producing 2,000 blows per minute, the 65-lb. drill operates at a pressure of 85-lb. per square inch from a single 1-in. air line.

Piston bore and stroke in the new Atlas Capaco drill is 2¾ in. The drill's rotation chuck is designed for ⅞-in. hexagon 4¼-in. collared shanks. Standard rotation is on the return stroke but the "Lion" also is convertible to downstroke rotation.

Flushing and blowing is done through a large concentric axial tube, water from the ½-in. supply line being controlled by linkage to the drill's throttle.

The new drills are available from Atlas Copco Eastern Inc., 151 Linwood Ave., Paterson, N. J., and from Atlas Copco Pacific, Inc., San Carlos, Calif.



New Lion Rock Drill (Above) Features Controls for Both Drill and Pusher Leg on Bach Head (Insert)

For more information circle 117 on Service Coupon Page 16 and mail now.

Frameless Dump Trailer

Shown ready for action is the all new Anthony tandem-axle frameless dump trailer of weight-saving design which is stated to permit hauling up to 2,000 lb. more legal payload than conventional semi-trailers. A redistribution of weight, a greatly simplified lifting mechanism and the complete elimination of conventional trailer frames all combine to make this additional payload possible. The body serves as its own frame, the axle is the hoist hingepoint.

The high tensile steel body, Anthony model RL-66, is 21 ft. long with a capacity of 17 yd. The Anthony model TA 83149 Teleramic hoist has a rated capacity of 25 tons. An informative catalog brochure describing the "inch worm" action and other advantages of this frameless dump trailer is available from Anthony Co., Dept. 2109, Streator, Ill.

Anthony Hoist and Dump Body

For more information circle 118 on Service Coupon Page 16 and mail now.

Swinging Drawbar Attachment for Traxcavators

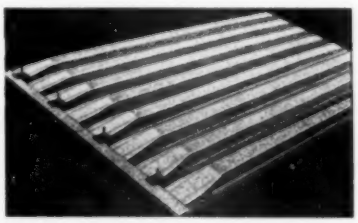
A new swinging drawbar attachment for No. 955 Traxcavators has been announced by Caterpillar Tractor Co., Peoria, Ill. Designed to give the No. 955 all the drawbar versatility of the D4 tractor, it can be used to pull the No. 40 scraper or any other piece of towed equipment. The center of the new drawbar's clevis is 15¾ in. above the ground. The drawbar has a lateral movement of 21½ in. It can be locked in any of several positions.

Swinging Drawbar Attachment

For more information circle 119 on Service Coupon Page 16 and mail now.

Steel Form for Concrete Bridge Flooring

A "Leave-in-Place" steel form for concrete bridge flooring has been developed by United Steel Fabricators, Inc., Wooster, O. Designed especially for spans involving high or hazardous conditions, these forms can be adapted for almost all poured concrete floors. Fabricated from trapezoidally corrugated long-life galvanized steel sheets in laying widths approximately 24 in., they reportedly can be economically left in place.

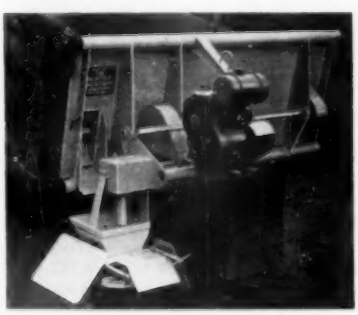


"Leave-in-Place" Steel Form

For more information circle 120 on Service Coupon Page 16 and mail now.

Highway Material Spreader

A new, improved material spreader for salt, sand and cinders, announced by The Fairfield Engineering Co., Marion, O., features simplicity of installation, as well as ease of operation. It will fit any standard 3 cu. yd. dump body tail gate, and can be installed in a very short time. Complete controls for the material being spread are located in the truck cab and operated by the driver. Readily adjustable baffles are provided at the distributor disc to control the spread width. The unit will spread material over two highway lanes and can also throw the material forward in order to obtain better traction.



New Fairfield Highway Material Spreader

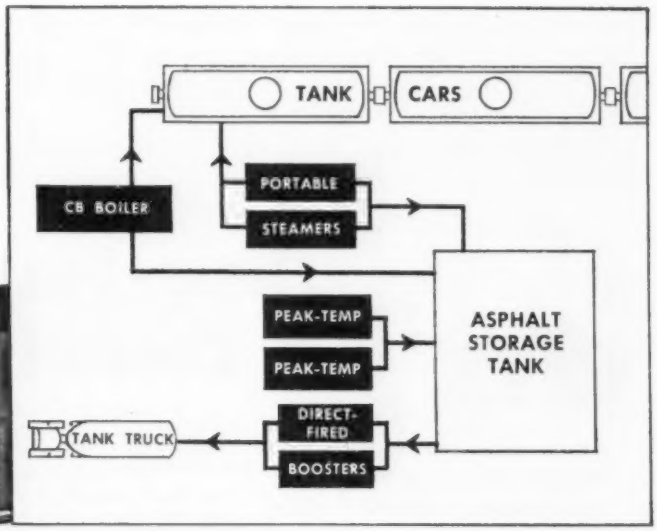
For more information circle 121 on Service Coupon Page 16 and mail now.

Highway Guard Rail

A new deep-beam standard highway guard rail, Protecto Beam, has been placed on the market by Syro Steel Co., Girard, O. Available in 10 and 12 gauge, Protecto-Beam meets the new standard specifications for beam type highway guard rail.

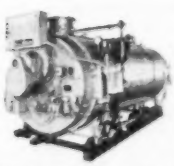
(Continued on page 131)

Receiving and distributing...

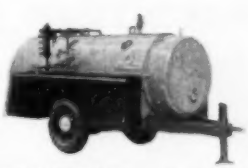


7 Cleaver-Brooks heating units assure asphalt temperature control!

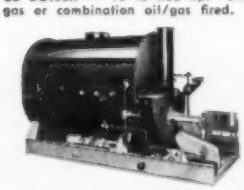
Plant handles as much as 150,000 gallons of asphalt daily.



CB BOILER — 15 to 200 hp. Oil, gas or combination oil/gas fired.



PORTABLE STEAMER — 50 to 125 hp, trailer and skid-mounted.



PEAK-TEMP OIL BOOSTER — Skid-mounted. Easily transported.

PORTABLE PUMPING BOOSTER — Has self-contained oil and gas tanks.

. . . for more details circle 191, page 16

Asphalt Products Co. is a model of a high-efficiency rail-land terminal.

Asphalt Products Company, Stevens Point, Wis., enjoys an excellent reputation for providing prompt, efficient delivery to its many customers in this territory. One of the largest rail-land asphalt terminals, it's ideally geared to serve adjacent county highway departments, municipalities, contractors and others with asphalt products.

The sketch above shows how their seven Cleaver-Brooks units are employed in controlling temperatures of asphalt. Asphalt in tank cars is first heated by steam from the 150-hp CB boiler, combined with steam from the two Cleaver-Brooks Portable Steamers. In storage, the asphalt is heated with steam from the CB boiler, Peak-Temp and Direct-fired Boosters for transfer to tank trucks.

***Illustrated at left** is the heat-transfer equipment at work in this 100% Cleaver-Brooks installation. Selection and planning details were the direct result of cooperative efforts of Cleaver-Brooks field engineers and Asphalt Products Company. Assistance like this is available to you without obligation.*

Write: Cleaver-Brooks Company, Dept. P, 395 E. Keefe Ave., Milwaukee 12, Wisconsin.

Cleaver Brooks

ORIGINATORS OF THE SELF-CONTAINED BOILER

Rock Salt . . . and Today's Roads

by **INTERNATIONAL SALT COMPANY, INC.**—America's largest producer of salt

Now—Faster Ice and Snow Control at Lower Costs

Actual case histories from Buffalo and Rochester, New York, show you how STRAIGHT ROCK SALT saves money, increases safety, works faster. These stories also give you details on winter street-maintenance programs involving rock salt.

Buffalo and Rochester, N. Y., are typical of the hundreds of cities throughout the nation's ice belt now using *straight* rock salt for ice and snow control. Here are some of the reasons why these cities have adopted this method . . . and eliminated sand and cinders from their winter programs.

According to Mr. Frank J. Stahl, Buffalo's Director of Streets, safety is the most important factor. "During snow and ice storms, straight rock salt makes our streets much safer for the daily traffic load of approximately 400,000 vehicles."

In contrast, the "old method of sand and cinders is beneficial to only a few drivers. These abrasives generally blow away soon after they're applied, and they never melt any ice."

Mr. Stahl also reports that straight rock salt has proved to be far more economical than any other control method. "Even for a continuous operation of salting streets, less overtime is required. That's because rock salt goes so much further than abrasives. In fact, only abnormal conditions require a repeat salting during an 8-hour period. When sand is used, it must be reapplied time and time again during the same shift."

Using straight rock salt, Buffalo (with over 1,900 curb miles of street) has been able to put a "watchdog" method into effect. Under this system, ten spreader operators are on duty for each of three shifts over the 24-hour period. This system is in effect 7 days a week. And to implement the 10 salt trucks on "watchdog patrol," an additional 10 trucks are in readiness if the situation demands attention on lesser-used arteries, side streets, etc.

Other benefits from the use of straight rock salt in Buffalo include an "uplifting of employee morale." Because the work goes faster, and with better results, Mr. Stahl reports that "the use of salt has been greeted enthusiastically by our workers. They now get a feeling of accomplishment and satisfaction."

From Rochester, N. Y., comes a similar story on rock salt. Safety is also the prime consideration here, according to Frank J. Vicaretti, Superintendent of Streets. "With rock salt our traffic moves freely, and without delays. Icy ruts on the streets are completely eliminated. And even during last winter's heaviest snowfall—16″—with straight rock salt we kept our streets clear."

Speed is a big factor, too. "Applying straight rock salt from trucks is much faster than using plows and graders, or spreading sand and cinders. For example, 16 salt trucks will handle a 2″ to 4″ snowfall, where over 100 plows might be ordered out for the same fall."

Rock salt's effectiveness in controlling ice and snow also permits a new, economical maintenance program in Rochester. This program involves 16 salt trucks from 4 AM to noon; and 16 trucks from noon to 8 PM. A skeleton crew (10 trucks) takes over from 8 PM to 4 AM except in heavy-snowfall emergencies, where six extra men are held over.

Mr. Vicaretti reported additional advantages from his use of straight rock salt. "The cost of handling and hauling snow, of course, has been greatly reduced. And mixing sand and cinders is a time-consuming job we've completely eliminated. There's free drainage in the sewers during the winter, too; and no spring cleanup expense."

DURING ONE OF ROCHESTER'S heaviest snowfalls, Sterling Rock Salt was applied to this street. In minutes, snow and ice were changed to slush for quick removal. Pavement was clean, and traffic was again moving safely.

STERLING ROCK SALT USED BY BUFFALO, ROCHESTER—and by hundreds of other cities, highway departments, counties

Sterling is the famous rock salt that melts more ice and snow—faster; covers more road mileage—faster. Just *one* truckload of Sterling Rock Salt covers as long a stretch of road as five truckloads of abrasives. You need only 500 lbs. of Sterling Rock to treat a mile of 20′-wide highway.

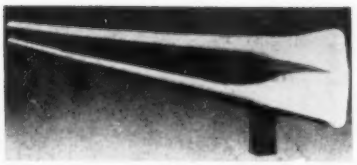
Sterling Rock Salt for ice and snow control is surprisingly low in initial cost, too. And this year, you can store it *out of doors* ready for immediate use. A newly perfected chemical agent, Sterling Storite, helps to protect outdoor stockpiles of salt from caking . . . so the salt "runs freely" whatever the weather. With Storite, expensive sheds are no longer necessary, and your salt can be stored at convenient roadside locations.

Free technical advice on your ice-control program. There's still time to get greater efficiency and economy in your ice-control campaign. Just get in touch with International Salt Company. One of our skilled and experienced "Salt Specialists" will help you set up a comprehensive snow- and ice-control plan . . . give you details on delivery of Sterling Rock Salt . . . and supply information on storage and handling.

International Salt Co., Scranton, Penna.
Sales Offices: Atlanta, Ga.; Chicago, Ill.; New Orleans, La.; Baltimore, Md.; Boston, Mass.; Detroit, Mich.; St. Louis, Mo.; Newark, N. J.; Buffalo, N. Y.; New York, N. Y.; Cincinnati, O.; Cleveland, O.; Philadelphia, Pa.; Pittsburgh, Pa. and Richmond, Va.

FOR ROADS, INDUSTRY, FARM, AND HOME—
STERLING SALT
PRODUCT OF INTERNATIONAL SALT CO., INC.

. . . for more details circle 221, page 16



Protecto-Beam Highway Guard Rail

Companions to Protecto-Beam are Protecto-Rail Guard rails. There are three styles of Protecto-Rail, the high-rib, 8 ft. x 7 in., the flat-rib, 8 ft. x 8¾ in., and the 9 in. heavy duty rail, 8 ft. x 6 in. These are designed for erection at parking lots, shopping centers, schools, parks, factories, buildings, drive-ins and homes.

For more information circle 122 on Service Coupon Page 16 and mail now.

All-Steel Folding Barricade

A new all-steel folding traffic warning barricade, Model B, for use with flasher safety lights, has been announced by R. D. Fagerol Co., Kent, O.

Finished in highway safety yellow or white and black for maximum visibility during daylight hours, Model B barricades are designed for use with flasher safety lights for after-dark traffic protection. Reflector tape is also available. Battery-powered flasher safety lights produce neon flashes, said to be visible for over one mile, at a rate of 90 per minute. Heavy duty flasher safety lights, fitted with special 8-cell batteries, flash continuously and require battery replacement only once every 60 to 90 days, the manufacturer states.

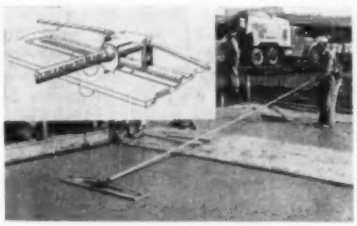
Model B Barricade with Flasher Safety Light

For more information circle 123 on Service Coupon Page 16 and mail now.

New Type Bull Float

A new type bull float, announced by Creative Metals Corporation, 1290 Powell St., Emeryville, Calif. gets the name "cam-tilt" from a cam located in the strong back. By simply twisting the handle the tilt of the float is instantly altered to give any desired tilt to the float. This handle twist adjustment compensates for length of handle being used and for height most convenient to the workman.

The handle is of springy, special wall, heat-treated aluminum tubing which telescopes one section within another to give any length from 12 to 22 ft. Floats of steel or wood, either in 4 or 5 ft. lengths, are available.



Cam Tilt Bull Float

For more information circle 124 on Service Coupon Page 16 and mail now.

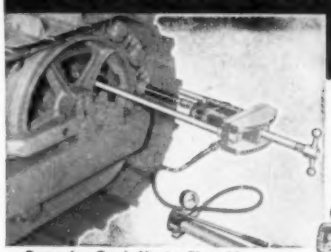
Tandem Rear Axles for Cranes

The first of a line of special purpose tandem rear axles for rubber-tired cranes is offered by the Industrial Brownhoist Corporation, Bay City, Mich. The new axle assemblies are intended primarily for use with crane carriers rated at 30 tons or more lifting capacity. One assembly — the Model 440, designed for cranes of 30 to 50 tons rating — is now in production, and a Model 460 for cranes up to 100 tons will be available soon.

The Model 440 employs a conven-

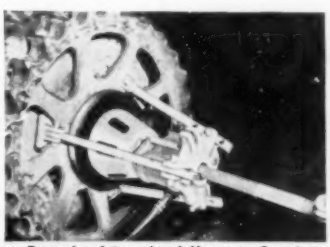
There's Something
BIG
Coming From
BUCYRUS ERIE
NEXT MONTH!
196E56-e
. . . for more details circle 275, page 16

CRAWLER TRACTOR SPROCKETS - MASTER PINS
REMOVED in MINUTES in the field
with ONE
OTC HYDRAULIC PULLER



Removing Track Master Pin with OTC Hydraulic Ram and Adaptors.

Hydraulic Ram and Puller makes both jobs easier.

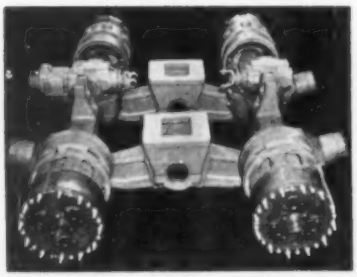


Removing International Harvester Sprocket with OTC Hydraulic Ram and Adaptors.

One man can remove a Crawler Track Master Pin or a Sprocket or both in mere minutes with the OTC Hydraulic Puller and Attachments. Available in 50 ton or 100 ton capacities these versatile sets are easily and quickly put to work in the shop or field. Hand or electric pumps are available . . .

The OTC POWER-TWIN HYDRAULIC UNITS are also easily adapted to pull, bend, straighten, press or spread—pull or install bearings, sheaves, gears or pulleys on all types of contractor equipment. Quickly pay for themselves in man hours saved. For the complete story on the OTC Hydraulic line write for Bulletin HY-55.

OWATONNA TOOL COMPANY
381 CEDAR STREET • OWATONNA, MINNESOTA
. . . for more details circle 244, page 16



Model 460 Axle

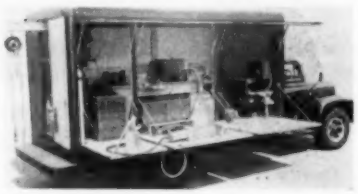
tional differential center unit combined with a planetary wheel end for final reduction to produce overall axle ratios of 17 to 42. This planetary axle construction is stated to reduce the loads and stresses on all drive line components such as propelling shafts, universals, and differentials, thus eliminating failures due to overstressing. The Model 440 axle assembly has a nominal capacity of 100,000 lb. The load carrying housing is a heavy alloy steel casting, heat-treated for highest strength and provides integral supports for rubber-mounted rocker beams.

For more information circle 125 on Service Coupon Page 16 and mail now.

Mobile Machine Shop

A new line of Davey mobile machine shops, reputed to meet the needs of virtually every type of user operating over extensive areas, has been announced by Davey Compressor Co., Kent, O.

Shop assemblies vary from relatively simple items of power equipment to large collections of tools and accessories. Basic units are Davey air compressors and power and welding generators. These are driven direct from the truck engine through a Davey heavy-duty power take-off. Shops can be mounted on practically every make and model of truck.



Typical Davey Mobile Machine Shop

For more information circle 126 on Service Coupon Page 16 and mail now.

"Tube Rod" Electrodes

A new line of "tube rod" electrodes, announced by the American Manganese Steel Division, American Brake Shoe Co., Chicago Heights, Ill., is specially developed for semi-automatic hardfacing.

The new electrodes are $\frac{3}{32}$ in. diameter drawn tubular wire and act much like mild steel solid wire in the welding machine. The tube rod is a perfectly round steel-wire shell with the various alloys firmly enclosed within the shell. The steel shell of the wire is work-hardened and thus prevents any deformation or snarling of the rod during welding.

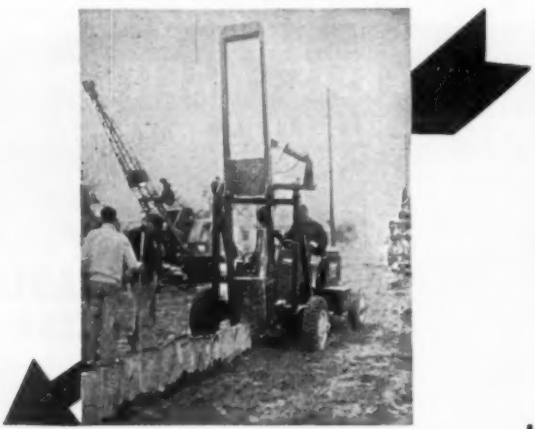
The special tubular construction of the electrodes can be driven by feed rollers found in all semi-automatic hardfacing welders.

The most important gains claimed for the new electrodes are high metal deposition, longer wear life of parts, and speed and ease of welding.

For more information circle 127 on Service Coupon Page 16 and mail now.

Building Up Lip of Worn Backhoe Bucket with S/A Manganese

See You at the Road Show



Arrow MOBILE HYDRAULIC HAMMERS ARE VERSATILE

Use ARROW MOBILE HYDRAULIC HAMMERS to drive shoring—posts—piling. Use them to break all types of paving—to cut asphalt—to compact trench backfills. *You'll save money and do a better job in less time.* ARROW MOBILE HYDRAULIC HAMMERS can be fitted with a wide variety of tools for special jobs. Exclusive creeper drive, with foot-controlled start and stop, is just one of the many money-making extras ARROW gives you. Get ALL the facts—learn why you get more for your money in ARROW MOBILE HYDRAULIC HAMMERS.

Write, Wire or Phone for complete information.

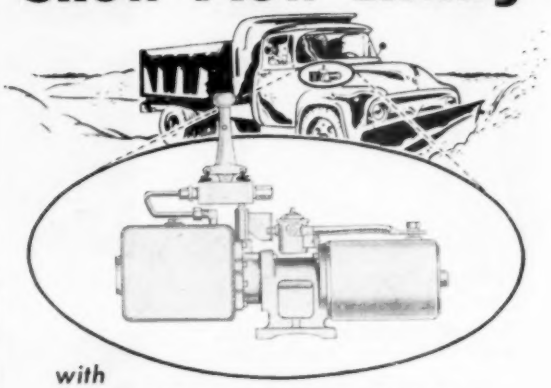
ARROW MANUFACTURING COMPANY

194 WEST DAKOTA AVE. DENVER, COLORADO

. . . for more details circle 180, page 16

Fast-Automatic

Snow Plow Lifting



with

MONARCH DYNA-MIGHT POWER HYDRAULIC CONTROLS

Fan Belt or Electric models available for practically all makes of trucks. See your dealer or write for full details.

MONARCH

1856 100 YEARS 1956

ROAD MACHINERY COMPANY

1331 Michigan St., N.E. Grand Rapids 3, Michigan

. . . for more details circle 241, page 16

ARMCO PIPE

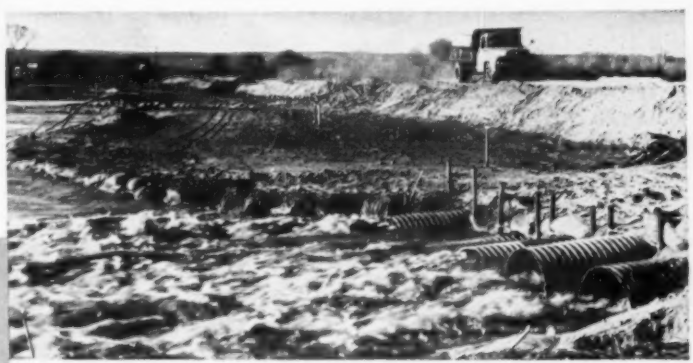
solves many problems as a construction tool

A familiar sight in permanent drainage installations of all kinds, Armco Corrugated Metal Pipe also provides the quick, economical answer to many temporary problems in the field. Drainage under run-around roads, detours and access roads are a few of the jobs you can do with versatile Armco Pipe. It is easy to handle and install and is completely salvable for re-use.

This Armco Pipe provided drainage under a temporary access road on the Ohio Turnpike contract of A. J. Baltes, Inc., Norwalk, Ohio.

A battery of Armco Pipe-Arch structures provides the waterway area for this temporary "bridge" installed to handle heavy equipment moving material from a deep cut section on the West Virginia Turnpike.

Corrugated Metal Pipe culverts handle the winter flow of the Rio Grande River under temporary access road. Sharp & Fellows Contracting Company, Los Angeles, used the road during construction of new Alameda Bridge near Albuquerque.

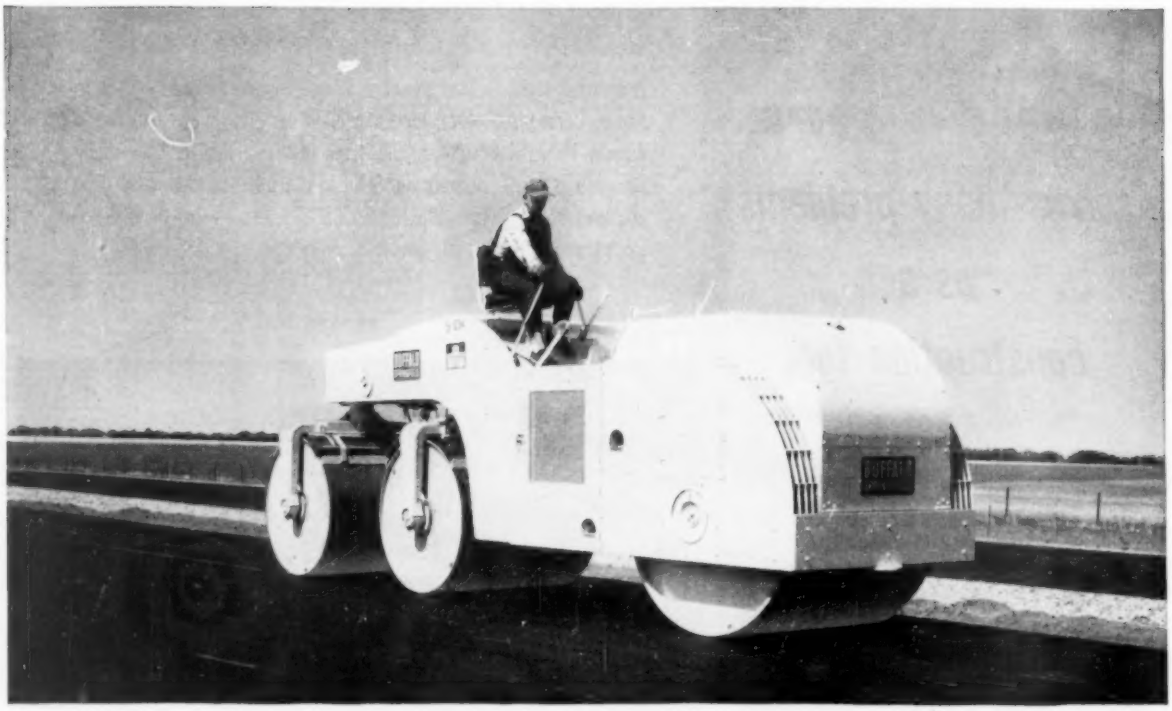


ARMCO®

Armco Drainage Structures

A network of 50 Armco Plants makes it easy to get the Armco Pipe you need when you need it. Write us for details or help with special drainage problems. Armco Drainage & Metal Products, Inc., 3416 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

. . . for more details circle 179, page 16



"EASIEST HANDLING ROLLER" ... says operator

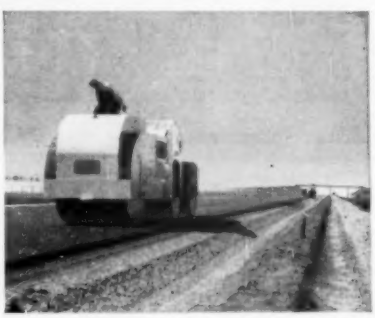
as Buffalo-Springfield "Walking Beam" 3-Axle Tandem compacts Kansas Turnpike for San-Ore Construction

San-Ore Construction Co., McPherson, Kansas, used this Buffalo-Springfield Heavy-Duty "Walking Beam" 3-Axle Tandem Roller with *Complete Compaction Control* to get 99% specified densities on Sections 1 and 2 of the Kansas Turnpike.

Said Earl Robinson, operator: "We're finishing 2¾" asphalt down to 2½", and this roller is doing a beautiful job. There's plenty of power, and the synchronized hydraulic steering makes it the easiest handling roller I've ever run."

To which Charles Nickel, Superintendent, added: "This roller works and operates better than anything we have on the job."

Buffalo-Springfield's 3-Axle Tandem is *the best* 3-Axle Roller because its exclusive "Walking Beam" design and construction permits complete compaction control. There is never an increase in compaction pressure except when and where it is needed . . . on the high spots only! Then, through the "Walking Beam" semi-locked action almost *3 times* the normal compaction pressure of the center roll may be applied to the high spots, providing a leveling action unequalled by any other type 3-axle tandem roller. No need for added cross-rolling time and expense, and consequently no possible damage to material that has been compacted and set. Another feature of the "Walking Beam" action is that all rolls can be released for full floation whenever the leveling action is not desired.



Let your nearest Buffalo-Springfield distributor show you why anything *less* than a genuine Buffalo-Springfield 3-Axle Tandem with exclusive "Walking Beam" Compaction Control is old-fashioned! Ask or write for Bulletin No. S-71-1255.

BEAM, semi-locked. Lead guide roll can rise above but not go below its normal position.

FIRST guide roll encounters "hump" exerting only normal pressure, "prepares" material.

CENTER guide roll rises on "hump," lifts lead roll off ground, exerts triple normal weight.

DRIVE roll follows through with normal pressure. Beam can be locked and unlocked.

The Standard of Comparison

BUFFALO-SPRINGFIELD ROLLER COMPANY
SPRINGFIELD, OHIO

. . . for more details circle 186, page 16

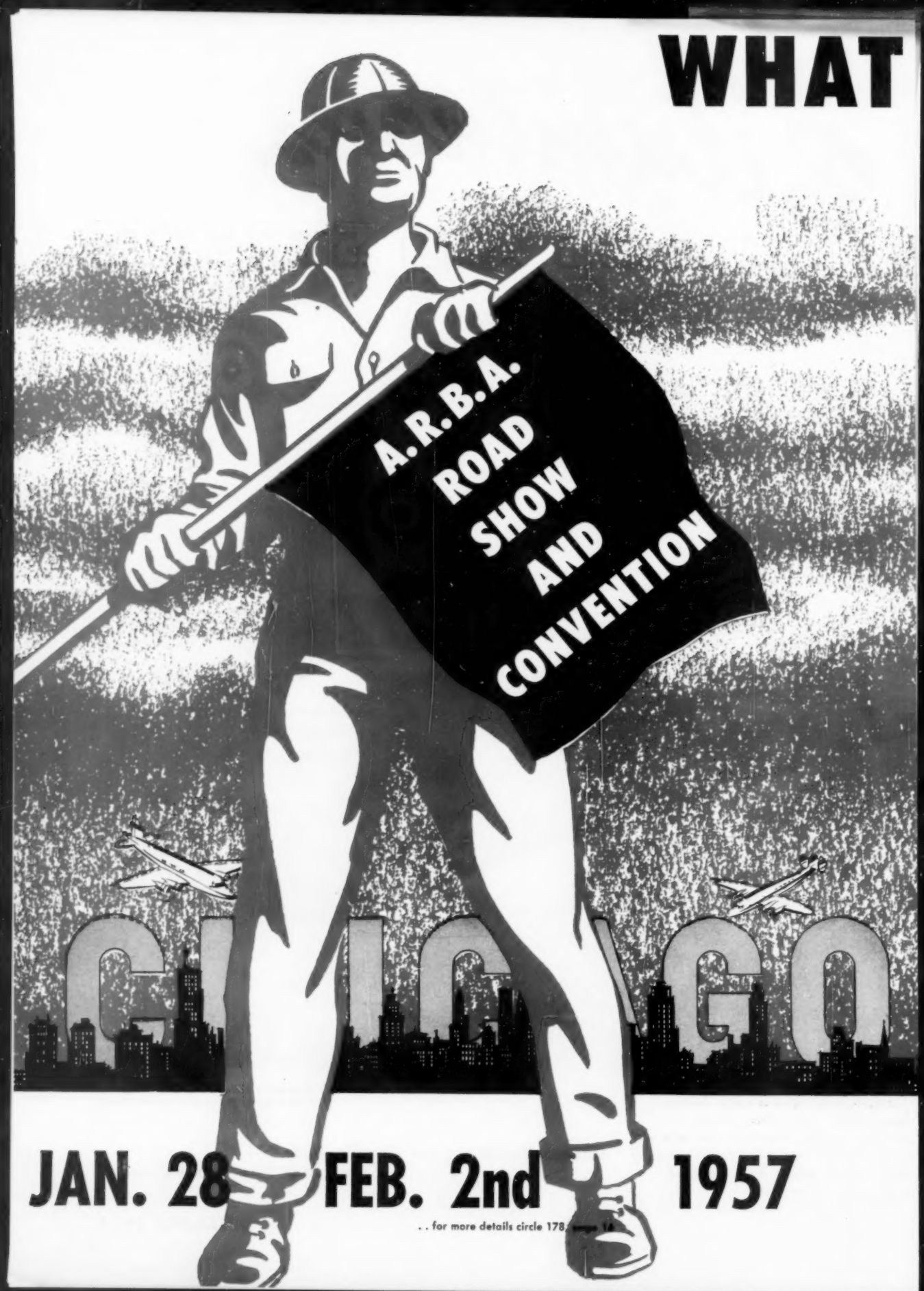
Bituminous ROADS AND STREETS

Last paving being placed on Kansas Turnpike, where crushed stone subbase and base and heavy-duty asphaltic concrete pavement were placed for 179 miles of 4-lane divided highway in a single working season. Reno Construction Co., contractor.

Published by Gillette Publishing Company, 22 West Maple Street, Chicago 10, Illinois

Diluted Emulsions for Flexible Base
—review of Texas' growing practice

DECEMBER 1956


WHAT
A.R.B.A.
ROAD
SHOW
AND
CONVENTION
CHICAGO
JAN. 28 FEB. 2nd 1957
. . for more details circle 178

YOU'LL HEAR THERE

THE ARBA CONVENTION

will open Monday morning, January 28, 1957, with suitable ceremonies. For five days you will have the opportunity of attending the greatest seminar on roads and road construction ever gathered together. Every effort has been made to secure people of importance and authority to talk to you on the critical subjects of the industry.

You will hear:

- Senator Albert Gore of Tennessee
  Chairman of the Senate Sub-Committee on Roads
- Senator Dennis Chavez of New Mexico
  Chairman of the Senate Committee on Public Works
- Rep. George H. Fallon of Maryland
  Author of the Highway Bill and
  Chairman of the House Sub-Committee on Roads
- Senator Francis Case of South Dakota
  Ranking minority member of the
  Senate Sub-Committee on Roads
- Rep. Charles Buckley of New York
  Chairman of the House Sub-Committee on Public Works
- Rep. J. Harry McGregor of Ohio
  Ranking minority member of the
  House Sub-Committeee on Roads

—and many other well-known authorities on the Road situation. These men have played a great part in the formation of the coming road program. No group knows the subject better.

Technical Sessions will begin Monday at 1:30 P.M. and *You will hear:*

- W. A. Warrick, Consulting Engineer of the John Clarkson Co. of Albany, N. Y.; and K. B. Woods, Head of the School of Civil Engineering, Purdue University. They are outstanding authorities on "The Design of Rigid Type Pavements."
- Fred F. Florence, President of the American Bankers Association (Republic National Bank of Dallas, Texas) will speak on "The Bankers' Part in the Accelerated Federal Aid Road Program."
- A. E. Johnson, Executive Secretary, American Assn. of State Highway Officials, Washington, D.C., talking on "State Financing of the Road Program."
- A. C. Clark, Deputy Commissioner, Engineering Div., U. S. Bureau of Public Roads. His address will be, "Engineering the Accelerated Road Program."
- George M. Foster, Chief Deputy Commissioner, Michigan State Highway Department, East Lansing, Michigan, will talk on "Building Roads with Modern Engineering Methods."

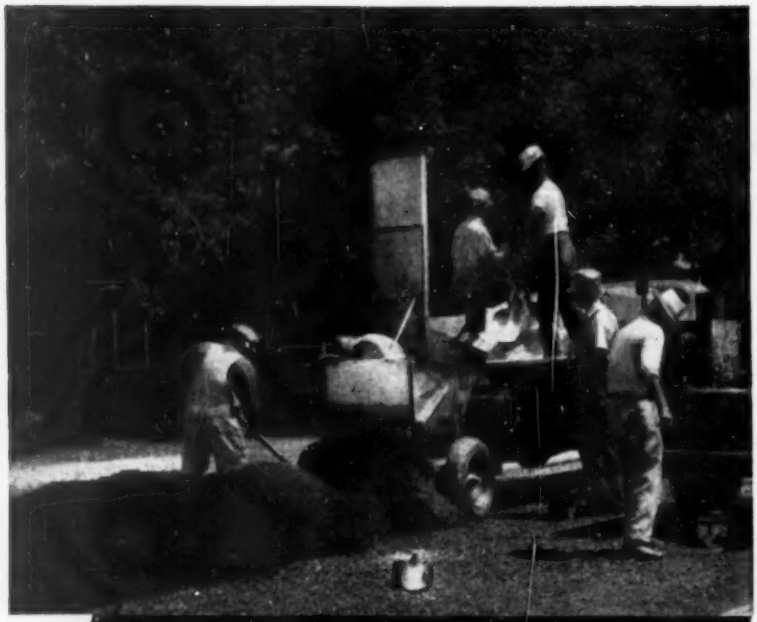
Other important subjects will be discussed by Nationally Known Experts.

- James W. Spencer, Highway Research and Extension Engineer, Department of Agricultural Engineering, Cornell University. President, Educational Div. of ARBA. He will discuss, "Keeping Highway Engineering Education Abreast of Modern Techniques."
- Fred Burggraf, Director, Highway Research Board, Washington, D. C., will give a report on "AASHO Illinois Test Road."
- J. E. Buchanan, President, The Asphalt Institute, University of Maryland, will give an address—"Bituminous Materials for Pavement Construction."
- C. Homer Cash, Road Engineer, Michigan State Highway Department, Lansing, Michigan, will talk about "Reinforcing Concrete Design Practice in Michigan."

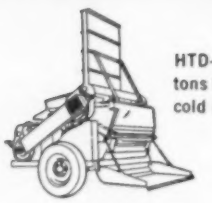
There will be panel discussions on the many problems of the engineer and contractor. Photogrametry, electric computors, traffic problems, maintenance, bituminous pavement construction, stabilization, financing, illumination and related subjects will all be treated in detail.

This is just a small part of the total program. MAKE YOUR PLANS TO ALLOW SUITABLE TIME TO ATTEND THESE IMPORTANT SESSIONS.

INTERNATIONAL AMPHITHEATRE
CHICAGO

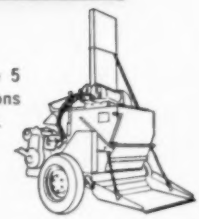


Be sure of
Durable Pavement
Patching and Resurfacing
. . . Regardless of Weather



HTD-500 . . . up to 7 tons hot mix, 15 tons cold mix per hour.

HTD-B . . . up to 5 tons hot mix, 10 tons cold mix per hour.



ENGINEERED to handle on-the-job mixtures of asphaltic concrete, sheet asphalt, sand asphalt or mastic asphalt (hot or cold) at remarkably high speed, McConnaughay HTD Mixers are dependable and efficient. The illustration above shows a Model HTD-B at work on a small resurfacing job, but it is equally effective for patching jobs . . . under wet or dry conditions. Here's exactly what you need to meet all conditions with least effort and lowest possible costs the year 'round. Write, wire or phone today for details and specifications.

K. E. McCONNAUGHAY
LAFAYETTE, INDIANA

National distributors: Asphalt Equipment Co., Inc., 3314 Cherry Lane, Fort Wayne, Indiana

. . . for more details circle 234, page 16

● A finished base with emulsified asphalt seal, on which asphalt concrete is being applied. Tack coat was omitted.

Texas Experience:

By Thomas K. Wood

Senior Resident Engineer, Texas Highway Department, Austin

AN IMPORTANT recent development in the Texas highway department district 14 around Austin, is the use of diluted emulsified asphalt. We have had such splendid results with the emulsified asphalt treatment in this area, that we now include this item on practically all road construction projects. With the help of Joe Gresham, district construction engineer, and of the various resident engineers, I have outlined our thinking, procedures and results to date.

This subject is not new; many engineers in other areas have had considerable experience in the use of diluted emulsions in base construction. Consequently, it would not be possible to set forth one procedure and expect it to solve all of your problems or fit all types of materials under all conditions. The method, however, is a flexible one, and flexibility of application is essential to its best use.

A diluted emulsion, as we know it, is defined as a mixture of emulsified asphalt, designated as EA-HVMS under standard Texas highway depart-

● Shows a contractor's typical storage and pumping facility for handling emulsified asphalt. The asphalt is pumped from the large storage tank to the three 55-gal. drums for measurement, then pumped into the sprinkling truck.

Diluted Emulsions for Flexible Base

This low cost method offers the advantage of combining a dust palliative with better moisture retention and hence better compaction, at a saving in sprinkling and other cost elements.

ment specification Item 350, and plain water as covered under the standard Item 202 "Sprinkling." Percentage-wise the mixture normally consists of from 2 to 10 percent of emulsified asphalt and 98 to 90 percent of water by volume. We normally operate under a special specification (reproduced with this article), which is worded to provide the field engineer with the utmost flexibility in utilization of this material.

● *Equipment* required for the handling and application of this diluted emulsion normally consists of the following: (1) storage tank for the emulsified asphalt; (2) container to measure the asphalt for each individual application, normally two to four 50-gal. drums interconnected and calibrated; (3) simple pump system capable of moving the asphalt to the measuring container and thence to the water sprinkler truck; and (4) standard water truck meeting the usual state requirements.

Diluted emulsion has been used in Texas for some time as a dust palliative. Cities and counties as well as the state have made such use. The beneficial results have sometimes been reduced by the haphazard manner of application, and the disregard for traffic during and following application. A motorist who has just had his car spattered with diluted emulsion has just cause for complaint.

Dust Control

Although it has been our practice to use the emulsion on the subgrade, detours, etc., for dust control, this report will be limited to its use in processing and finishing flexible base courses. The object of this procedure is *not* asphalt stabilization in the sense that we know it, for example in a soil-asphalt base. Basically, diluted emulsion in processing flexible bases results in a twofold benefit; (1) as a dust palliative to minimize the discomfort to traffic and neighboring property owners which is an important factor, considering that a large volume of our work must be done "under the wheels" of traffic, and (2) as a holding factor in connection with the finished base surface. The importance of the holding factor depends on the type of base material and the time it is to be held.

● *Various Procedures.* Initial experience was gained from several special farm-to-market jobs performed by state forces. The general procedure consisted of adding 5 to 10 percent EV-HVMS asphalt to the sprinkling water, and using this mixture in lieu of the normal sprinkling water in laying in the top 3 in. of the flexible base. As a rule-of-thumb about 0.1 gal. of diluted emulsion was used per sq. yd. per in. depth of base to be treated. This averaged about 6,000 gal. of asphalt per mile.

Satisfactory results have been thus obtained on more than a dozen such jobs involving various materials. As an example, two projects, one an iron ore base, and the other a sand-clay gravel admix, completed in the early winter after the closed season on asphalt and treated with diluted emulsion, have come through the winter as dustless all-weather roads with mini-

This article consists of the essentials of a paper on the subject given by Mr. Wood at the 30th Annual Texas Highway Short Course, Texas A & M College, April, 1956.

● **Stages in base laying operation. (Left): Diluted emulsion treatment in laying in top layer. A 5 to 10 percent solution is used in lieu of normal plain water in conjunction with blading and rolling. Half of the road is carry-**

mum maintenance. The base surface was reshaped and given final finish as necessary, preparatory to the application of the penetration surface treatment during the 1956 spring.

A study of five farm-to-market projects completed by contract during the past two years in our district, reveals the following procedure and results. These jobs in the eastern part of the district, utilized for base material a low P.I. gravel with necessary sand-clay admix. Past experience indicated that these low P.I. gravel bases gave difficulty in holding a finish on the surface, and tended to ravel when subjected to traffic. Consequently, it was proposed to apply 0.10 gal. per sq. yd. of EA-HVMS asphalt in a 5 to 10 percent dilution, through several applications to the finished base just prior to the placement of the penetration surface treatment.

In this case, the diluted emulsion was not used in laying the base in, but simply on the finished surface of the base, in the same manner as a prime coat and for apparently the same reasons.

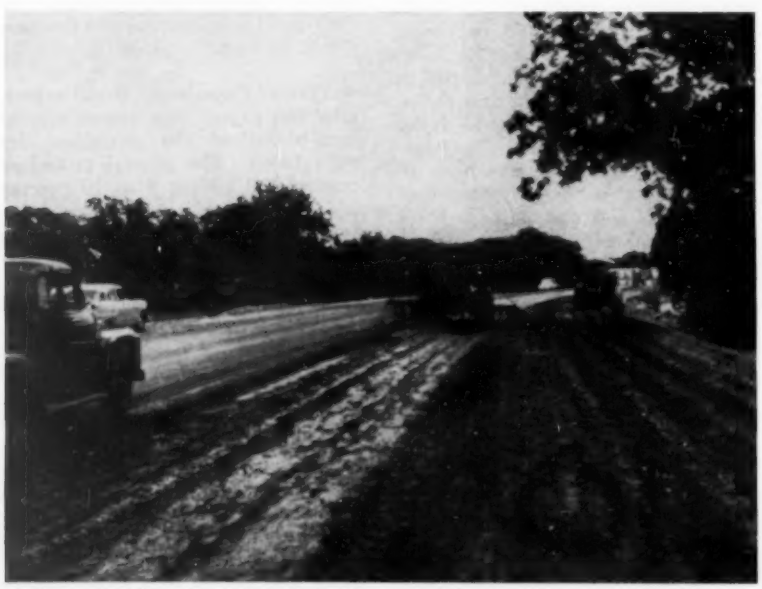
● *Low Cost.* Based on final construction figures, the average application rate on the jobs was 0.115 gal. per sq. yd. of surface; which at $0.16 average cost per gallon resulted in a cost of $0.0184 per sq. yd. For the 136,540 cu. yd. of base material placed, the cost of using the diluted emulsion amounted to $0.076 per cu. yd.

It is our opinion that the use of the emulsion treatment on this type of base will continue to reflect a reduction in the base cost, due to a material reduction in blading, rolling and sprinkling. In addition, this procedure permits more flexibility in the scheduling of the asphalt surfacing since the base can be held for longer periods of time in a finished state.

● *Another Example.* On a project in the western section of the district, consisting of rehabilitating one of our primary highways, we find a somewhat different picture of the diluted emulsion treatment. The base material consisted of what is called a Capp Mountain Limestone, which in many ways acts more like a sandstone than a limestone. However, when used as a flexible base, it will set up where most sandstones never actually do so. This material, under ideal conditions, requires about three days to set up, a disadvantage in construction under considerable traffic.

In an effort to control both raveling during initial setting up, and dust, it was decided to treat the top 2 to 3 in. of the 6 in. compacted base with diluted emulsion.

The following procedure and results were developed. After considerable experimenting, it was found that a 10 percent solution of emulsion and water added to the top 3 in., 6,000 gal. per mile on a 34-ft. width, gave best results. Based on a 60 percent residual asphalt factor, this amounted to about 1.0 percent of asphalt by volume in the top 3 in. of the base.



● **Shows the diluted emulsion being incorporated into the top 3 in. of flexible base.**

ing traffic on completed dustless base. (Center): Same, except at a different stage. (Right): Showing application of diluted emulsion on the nearly completed flexible base.

This procedure seemed to give excellent results; some sections so treated carried about 2,000 vehicles per day for sixty days without dust or undue distress. Some maintenance sprinkling water, using a 3 percent solution of emulsion, was required, especially after rains, but this was not extensive.

Surface Treatment

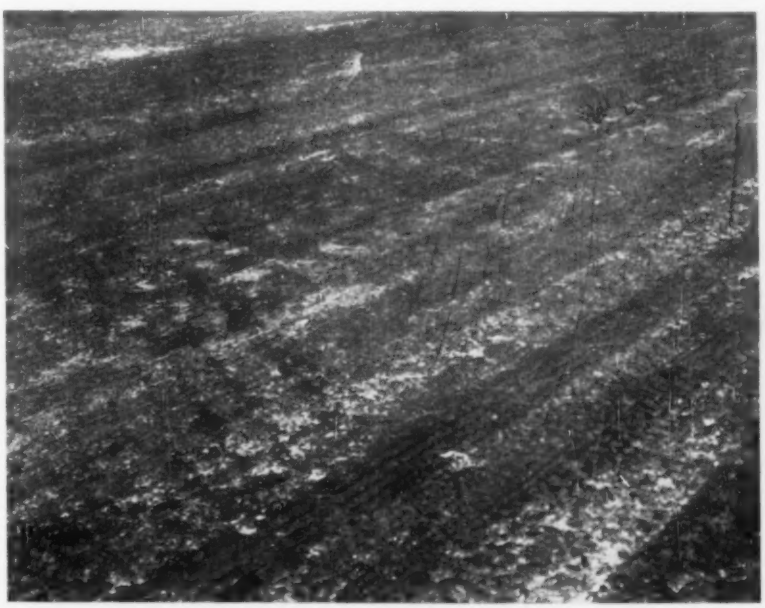
However, the above procedure did not result in a happy ending when it came to the process of finishing the base for the penetration surface treatment, according to the engineer's report. It was found that minor irregularities of about ¼ in. depth were very hard to get out. It was next to impossible to cut the stabilized stone base and almost as difficult to make any material stick in the depressions. Of several methods tried, best results apparently were obtained by slush-rolling, using plain water followed by normal blading and rolling. The latter method of finishing was adapted, but the riding surface secured was somewhat "chattery" and not entirely satisfactory.

● *Second Procedure Tried.* The entire procedure was then changed, whereby the full 6 in. base depth was set up using only plain water. On the following day it was reshaped to line and grade, and on the third day it was shaped again and slush-rolled with plain water. When the slush had dried sufficiently to allow blading, the section was shaved across and a 5 percent solution of emulsified asphalt and water was applied. Then a portion of the fines secured by shaving the base was spread back across the road and pneumatic rolled.

This process was continued until a mat of emulsion and base about ¼ in. thick had been developed. This mat proved to be excellent for carrying the traffic, with only an occasional freshening with a 3 percent solution of emulsion and water. The entire process required only 3,000 gal. of emulsified asphalt per mile of base 34 ft. wide.

Following the second procedure outlined, the final finishing proved less of a problem than previously experienced. By slush-rolling with plain water and adding fines bladed in from the sides, it was found that when the slush had dried sufficiently to be shaved off, the emulsified asphalt mat was practically eliminated. The base was then finished by conventional methods using plain water, rolling and blading. About the last two or three times over with a blade, a 3 percent solution of emulsion and water was applied to kill the dust and provide a satisfactory base for the Oil Asphalt. This procedure produced a first-class riding surface.

● *Heavy Traffic Project.* A major rehabilitation contract project was constructed during the 1955 season on a segment of the Interstate System carrying 5,000 to 6,000 vehicles per



● **Close-up of a freshly finished base surface utilizing emulsion.**

Special Specification on "Special Emulsified Asphalt Treatment" Texas Highway Department

- *Description:* This item shall consist of one or more applications of a mixture of Emulsified Asphalt (EA-HVMS) and water to be used as a base treatment, earthwork seal, prime coat or dust preventative. This mixture may be applied to the base course, subgrade, shoulders, or detours at the locations and to the extent shown on plans or directed by the Engineer.
- *Materials:* The amount of Emulsified Asphalt (EA-HVMS) in the mixture expressed as a percent of the total mixture, shall be within the limits specified on the plans. When tested by approved laboratory methods, the Emulsified Asphalt used shall meet the requirements of the Item 350, "Asphalts, Oils, and Emulsions." The water used shall be clear, free from industrial wastes and other objectionable matter.
- *Construction:* The Emulsified Asphalt and water mixture shall be applied by a self-propelled sprinkler meeting requirements of Item 202 so operated as to uniformly distribute the mixture in the quantity determined by the Engineer.
  The emulsion and water may be mixed in the sprinkler tank. The contractor shall make suitable provisions for agitating the two materials sufficient to produce a uniform blend. The sprinkler tank shall have been recently calibrated, and the engineer shall be furnished an accurate and satisfactory record of such calibration.
- *Measurement:* Emulsified Asphalt shall be measured by the gallon as delivered on the roadway. Water shall be measured by the 1,000 gallons as delivered on the roadway.
- *Payment:* The work performed and the Emulsified Asphalt furnished as prescribed by this item and measured as provided under "Measurement" will be paid for at the unit price bid for "Emulsified Asphalt (EA-HVMS)" which price shall be full compensation for furnishing all required materials except water, for all freight involved, and for all hauling, mixing, and distributing the mixture as specified; and for all manipulation, labor, tools, equipment, and incidentals necessary to complete the work.
  All water required will be paid for in accordance with the provisions governing the Item of "Sprinkling."

day. Here diluted emulsion proved an invaluable construction aid. The base consisted of three courses, the first an existing salvaged base, the second and third courses being crushed limestone with an average plasticity index of 6 to 8.

On the first four-mile section of this project, constructed during July and August, a 10 percent diluted emulsion, at a rate of about 0.10 gal. per sq. yd. was added to the base material in the top 1 to 2 in. of each course during the mixing and compacting operations. After each course had been compacted and shaped, an additional 0.06 gal. per sq. yd. was placed on the finished base. Construction in half widths permitted the treated surface to dry before traffic was routed over the new base course. The 0.06 gal. per sq. yd. noted included the amounts necessary to reseal sections where additional blading was required to maintain the base to its proper section.

On the second four-mile section, the resident engineer decided that he would vary the procedure and omit the emulsion from the setting-up operation, and treat only the surface of each base course. After the base had been set up and shaped to the proper section, the surface was sprinkled with plain water. After drying had formed a slight crust, but before the crust became dusty, diluted emulsion was added in two applications. After the surface had dried sufficiently, traffic was routed over. A total of 0.07 gal. per sq. yd. was applied under this procedure, which included the amount necessary to reseal sections where additional blading and rolling was required.

Of the two processes tried, the resident engineer is of the opinion that the second method was the better, in view of the saving of 0.09 gal. of emulsion per sq. yd. with apparently the same results.

- *Two Other Jobs.* To round out our discussion, I will discuss briefly a few aspects of experience with two primary highway construction jobs near Austin. Both were identical in cross-section, type of base material and ultimate surface treatment.

The first project completed in 1955, and carrying between 2,000 and 3,000 vehicles per day, had a 44-ft. finished base crown width, and 6 in. depth of crushed limestone base overlaying the existing base. Before base operations started, a Field Change request was submitted, wherein the proposed prime coat was eliminated and the rate of emulsified asphalt increased from 0.1 to 0.3 gal. This was so that the top 2 to 3 in. could be treated with diluted emulsion. When the subgrade (existing base) had been placed to section and treated with two light applications of a 5 percent solution, stone for the new base course was dumped and laid in on half the roadway section. In laying in the top 2 inches, a 5 percent solution emulsion was used in lieu of plain water.

An additional shot of the diluted emulsion was given the surface of the compacted base. After this surface had dried sufficiently, traffic was routed over it. The other half of the base section was then placed in the same manner, with dumping and laying operations coordinated such that the traffic would at all times have at least half of the dustless roadway for travel.

From 2 to 3 days after the last half of the base course had been placed

(Continued on page 148)

The primary advantages in the use of the emulsified treatment, as we see them, are as follows:

(1) Requires little additional equipment to apply.

(2) Cost is partially offset by a reduction in sprinkling, blading and rolling, and the elimination of prime and tack coats.

(3) Provides a dustless surface which is immeasurable in terms of public relations.

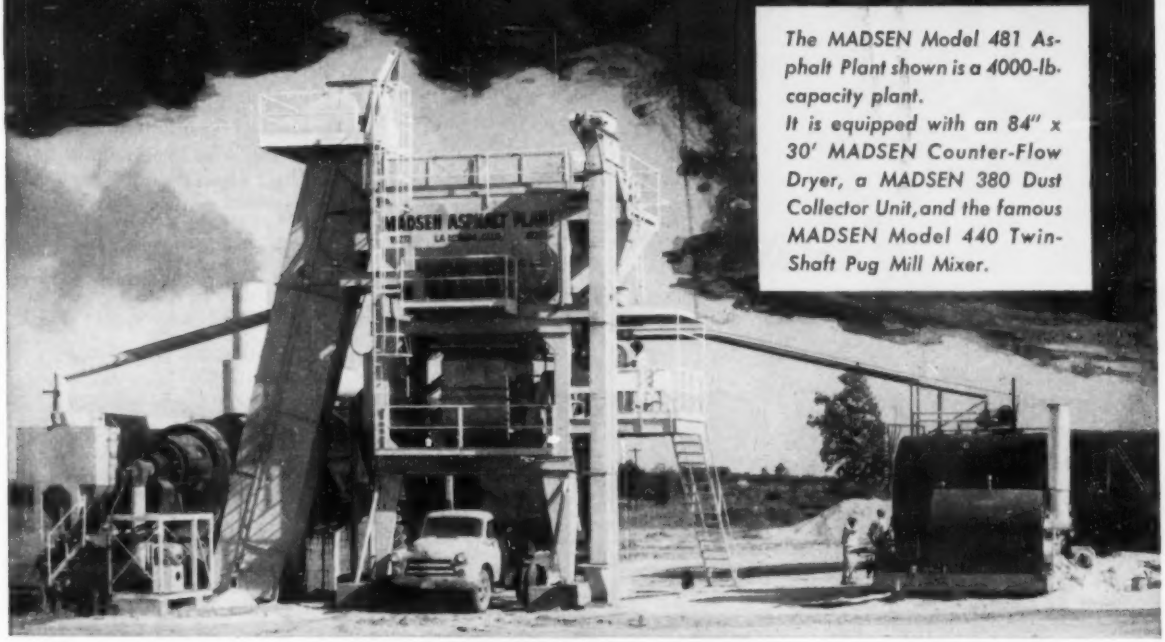
(4) Allows more flexibility in scheduling asphalt surfacing because base can be held in a finished state for longer periods of time.

We do not feel that the diluted emulsion is the panacea to all our construction ills; however, it is thought that when varied to meet the particular situation it can become an invaluable construction aid.

Get Set For Your Share..

Equipment that Serves

The owner of a MADSEN Model 481 Asphalt Plant is ready for a share of today's big road-building business and profits. Check the facts below and see why this outstanding plant produces greater owner profits on all types of asphalt mixing jobs.



The MADSEN Model 481 Asphalt Plant shown is a 4000-lb. capacity plant.
It is equipped with an 84" x 30' MADSEN Counter-Flow Dryer, a MADSEN 380 Dust Collector Unit, and the famous MADSEN Model 440 Twin-Shaft Pug Mill Mixer.

FACTS YOU SHOULD KNOW before you buy an Asphalt Plant

THE MADSEN MODEL 481 has years-ahead in-built capacity. It may be purchased as a 4000-lb. capacity unit and may be increased to a 5000-lb. or 6000-lb. plant with relatively minor modification costs.

THE MODEL 481 IS COMPLETELY PORTABLE. Has built-in gooseneck structures, fifth wheel plate, king pin and rear axle mounting brackets.

PLANT FEATURES THE FAMOUS MADSEN Model 440 Twin-Shaft Pug Mill Mixer (Patented) . . . with externally removable sectional liners, ground to precision fit at the factory for complete interchangeability and elimination of fitting in the field. Mixer has improved mixing action, faster discharge and has built-in oversize capacity.

THE MADSEN (Pat.) PRESSURE INJECTION SYSTEM used in the Model 481 pumps asphalt into the mill in 5 to 7 seconds.

THE MODEL 481 FEATURES ALL-AIR OPERATION of bin gates, asphalt pressure injection and mixer gate which reduces operator fatigue thereby increasing daily tonnage. Air-operation is faster, more accurate, which decreases time cycle from bin to truck.

THE EXCLUSIVE MADSEN BIN DESIGN (Patent Pending) used in the Model 481 eliminates segregation, provides uniform aggregate withdrawal, and promotes improved aggregate distribution in the weigh-box.

THE MODEL 481 features "station" greasing of heavy bearings. It's the easiest, safest plant to lubricate.

THE OVERSIZE CAPACITY WEIGH-BOX used in the MADSEN 481 Plant has air-operated gate, 4-point lever suspension, and is roller-mounted so that it may be quickly rolled out of the way for field maintenance.

These facts tell part of the story why more and more MADSEN Asphalt Plants are being used to meet the high production and exacting mix specifications required on today's big turnpike and highway jobs. Get the complete story from your Madsen Distributor or write MADSEN WORKS, Baldwin-Lima-Hamilton Corporation, Construction Equipment Division, P. O. Box 38, La Mirada, California.

ASPHALT PAVING PLANTS • PUG MILL MIXERS • AGGREGATE DRYERS • DUST COLLECTOR UNITS
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. . . for more details circle 237, page 16

● **Asphaltic concrete made with special refinery blended rubberized asphalt being placed on test area.**

Trial overlay with special rubber-asphalt binder

Last September engineers of the New Jersey Turnpike Authority made a trial overlay installation using a rubber-bearing bituminous binder known as Flintbinder A-2. The overlay section, 1½ in. thick by 36 ft. wide by 1,400 ft. long, is located on the southbound roadway between Interchange No. 11 and 12.

The purpose according to the manufacturer of the binder, was to evaluate the use of rubber and asphalt as an improved binder in flexible pavement.

The material, according to the Flintkote Company, differs widely from the products being promoted currently throughout the country. It is not a pellet or powder, or any other type of concentrate to be added to the asphalt, but rather is a completely blended homogeneous mix of rubber and asphalt. This completely blended binder was developed in an effort to realize fully the effects of rubber when mixed with asphalt.

The turnpike job was performed by Standard Bitulithic Company, Newark, New Jersey.

Flintbinder A-2 is a specially formulated and chemically compounded rubberized asphalt binder. It is recommended to be used in the same manner as straight asphalt on either new construction or resurfacing. It is delivered to the job site ready to use.

To secure a homogeneous and uniform material, the rubber contained in A-2 is dispersed evenly throughout the asphalt cement during the plasticizing operation. As received at the job site, Flintbinder is the finished binder, ready for use in the same manner as is standard paving asphalt. It is intended to be mixed with standard specification aggregates at the same relative temperatures as asphalt not containing rubber—about 300° F.

Engineers interested in rubber-asphalt technology are watching such binders, and likewise contractors are concerned with the possibilities of better plant control and job uniformity, economies such as elimination of weighing and handling of separate additives and problems of blending.

● **Standard equipment and methods were used for spreading and rolling of the special mix.**

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Handles all granular materials — salt, cinders, sand, calcium chloride, rock chips. Spreads at speeds up to 30 M.P.H. Clutch-controlled flow: steady or intermittent for hills and intersections.

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. . . for more details circle 253, page 16

NEW WOOLDRIDGE DISTRIBUTOR. Hatten Machinery Co., 3433 Fourth Ave., South Seattle, Wash., has been appointed exclusive distributor in western Washington for the complete scraper line of Wooldridge Manufacturing Division, Continental Copper & Steel Industries, Inc., Sunnyvale, Calif.

VIEWS AND COMMENTS

By H. G. Nevitt

The Sun Is Rising in the South

"Westward the course of empire takes its way" has been true in technology since the early inventions of the Chinese. And there is some prospect of the trend continuing, since the Communists respect, recruit, and reward technical knowledge and skill to a far greater relative degree than the democracies, particularly this country. Yet another quarter is beginning to be heard from. We have Latin America in mind, though other areas of which we have less specific knowledge such as Australia and South Africa seem to deserve similar comment.

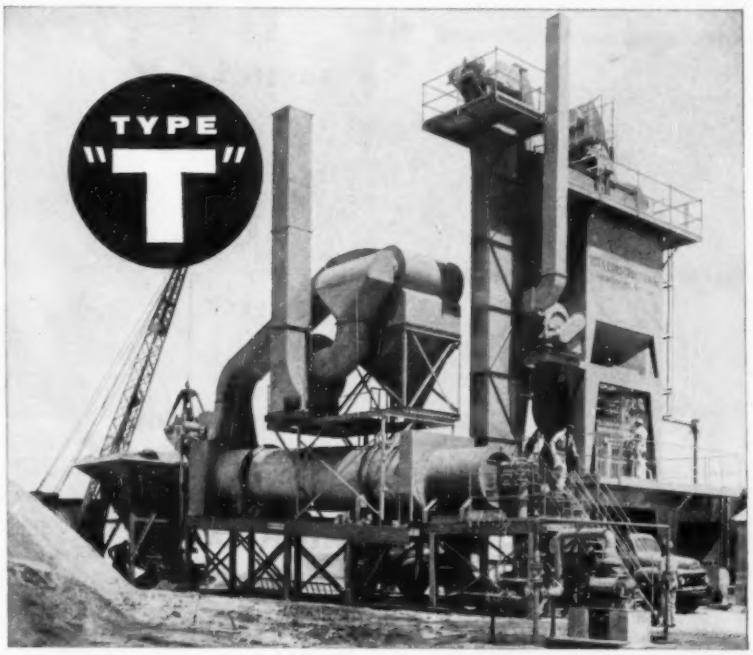
At the start of the century Europe was the uncontested leader in scientific matters. American ingenuity and aggressiveness had scored triumphs here and there, but in the fundamentals, in the application of the higher sciences to practical problems, and in research we failed to make much of a showing. So we looked abroad for technological leadership, our top flight men attempted to finish their training there, imported items were usually assumed better despite our independence and ability.

The aspect today is quite different. Europeans still take education seriously, and their average professional man is probably better grounded than ours. Likewise, they are doing outstanding work in certain fields; prestressed concrete structures, jet engine development might be good examples. But the economic situation has altered the basic picture. The bulk of the research and development is being done on the North American continent because we have the money and spend it; the literature abroad is filled with American references, and in general we are given credit for leadership despite continued doubts as to our standards of education and the interest of our technical men in applying themselves to really learning advanced mathematics, physics and chemistry, the utilization of which has become essential to our technical progress.

● The status of our Latin American neighbors to the south resembles in many respects that of this country a half century or so ago. We are looked to for knowledge and leadership—although European views are not ignored, and much of our precedence arises from the fact that we are the predominant source of capital as well as of technology. Our textbooks and literature are widely referred to, our procedures frequently adopted. We are being a good neighbor in many ways.

Accompanying this, however, are some interesting developments. The European attitude towards education seems to prevail in Latin America—at least there is a respect for technical men, and presumably for high standards in their qualifications, which is not seen in the United States. And some of the work being turned out reflects this. There is a tendency to get down to fundamentals, to refuse to be overawed by past approaches, which bears great promise for the future. Some excellent thinking, and some brilliant thinkers, seem likely to appear—in fact, have already done so.

Of course our friends to the south



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Other Type "T" features include new structural design . . . all-welded plate construction . . . new type Deister flat screen . . . self-contained dust bin . . . internal, self-contained overflows . . . individual trunnion roll drive on dryer . . . pneumatic controls, etc.

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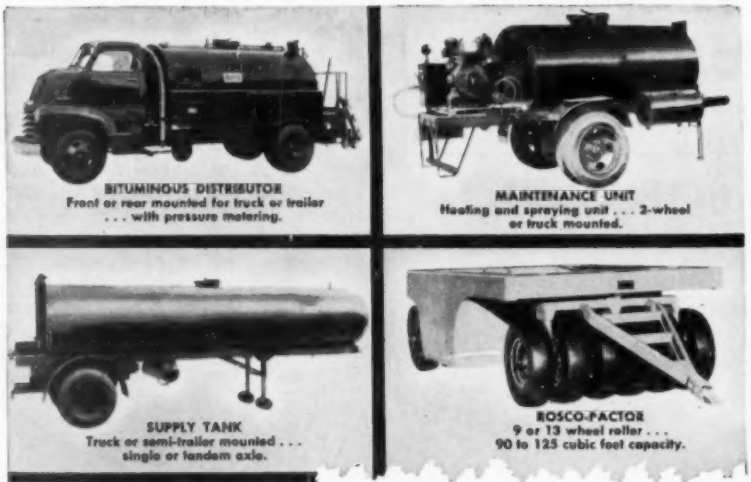
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have many obstacles to overcome, many pitfalls to beware. They must avoid the tendency to think that learning methods is sufficient, when actually in many cases the procedure is merely a guide to applying judgment and know-how which they have not had the opportunity to acquire. They must avoid both extremes—completely relying on us for their technical accomplishments, or failing to take advantage of our dearly bought experience, much of which cannot be transmitted except by doing. Likewise they must recognize that their problems are different; neither slavish imitation nor completely ignoring our solutions is wise. But with discernment, involving some restraint on the enthusiasm and self-confidence of their younger engineers along with well selected, really competent advice and help from this country, they will make rapid progress. Time, bringing increases in both the number of technical men and their experience, will of course prove an ally; but they must avoid dependence on this alone if they are to keep in step.

● Does this development concern engineers engaged in work in this country? We believe it does. There are possibilities of benefit to them in the development of methods by other countries. Necessity is the mother of invention; areas lacking our resources of both money and trained personnel may—particularly with assistance from us—develop new and simpler techniques for getting the job done. We have in times past hazarded the comment that complacency—always a threat to governmental operations, necessarily carried on by a bureaucracy—was perhaps delaying the advancement of highway engineering in this country.

The American temperament and habits have helped us create an impressive industrial machine, which has in turn added its weight to our natural advantages. Yet our assets are themselves developing disadvantages. Our dominant position can in time be lost by softness in our youth, by self-satisfaction in our leadership in the mechanical aspects (in contrast to the art) of living—or by unjustified confidence that when the need appears we can continue to rise to the occasion.

We will be well advised to watch the lands to the South. They have almost unlimited natural resources, and the bars to their development from climate and disease have been practically wiped out in only the last few decades by advances in medicine and other arts. They have a pioneering vitality, an inquiring attitude among their professional people, and respect for knowledge.

Naugatuck Surfa-SEALZ

Let's build highways to last!

DETOURS can't be avoided while new highways are being built... but there *is* a way that promises to *keep* those highways in *good condition, longer,* once they are opened! That is by building them with a rubber-bituminous or rubber-asphalt surface course... using Naugatuck's SURFA-SEALZ® as the synthetic rubber additive.

Year by year, test sections of "rubber roads" throughout the country continue to confirm the promise of longer life and greatly reduced maintenance! Accelerated laboratory tests add further evidence of increased adhesion to aggregate and strength of binder under a wide range of temperature and aging conditions.

Experience has shown that admixture of only 8-9% of SURFA-SEALZ makes it possible to use a *softer* asphalt surface, since the rubber retains the natural oils instead of permitting them to bleed to the surface. This greatly postpones the time when embrittlement begins to cause cracking and the need for repairs.

SURFA-SEALZ is readily available in convenient form for admixture at the job... requires no special equipment... involves no complications... adds only slightly to initial paving costs! Isn't it time *you* started making use of its advantages?

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Unlimited Versatility Assures Top Savings For Sweeper Owners

Little Giant Sweepers Offer Variety of Applications

Whatever business you are in, you will find a Little Giant Sweeper can open new opportunities for profit or savings.

Road contractors are gaining new income and cutting costs by using Little Giant Sweepers for cleaning old paving before resurfacing, leveling pea gravel, reclaiming aggregate from shoulders and for general job clean-up work.

Municipalities are cutting costs by employing Little Giant Sweepers for cleaning streets and alleys, snow removal and on surfacing operations.

County and state highway departments use Little Giant Sweepers for cleaning paved surfaces, snow removal and shoulder maintenance.

Airports clear snow and keep runways clean; industrial plants clean parking areas, storage yards; parks sweep snow and dirt from play areas, roads and parking lots; mines clean coal seams, maintain haul roads.

Whatever business you are in, you can increase your income or cut costs with a work-proved Little Giant Sweeper. There are five models — self-propelled, front-mounted for any prime mover or tow-type—to fit your exact need. See your Little Giant distributor or write direct to start your savings from Little Giant Sweepers.

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. . . for more details circle 231, page 16

Diluted Emulsions

(Continued from page 142)

and compacted, the entire base section was soaked with plain water and reshaped and rolled to "blue top" grades. Then, with the surface slightly damp, two more applications of a 5 percent emulsion were placed in half widths on the finished base. Considerable portions of this project, processed as just outlined, maintained their surface finish under the traffic volume noted for 30 to 60 days, and required no further blading or reshaping prior to placement of two 12 ft. lanes of hot-mix asphaltic concrete pavement. The 10 ft. shoulders were subsequently cut and pulled up to match the 1½ in. asphaltic concrete pavement, then sealed with two applications of emulsion, and a 2-course surface treatment applied.

● *Again Cost was Low.* The emulsified asphalt used totaled 0.25 gal. per sq. yd. based on the finished 44-ft. base crown width, or a cost of $0.037 per sq. yd. On this 4-mile job, if you compare the cost of the original plan quantities for the items of sprinkling, emulsified asphalt and prime coat, with the actual construction cost of the reduced item of sprinkling and the increased item of emulsified asphalt, an actual saving of $460 is reflected.

On the second project previously mentioned, carrying 2,700 to 7,240 vehicles per day with identical conditions involved with that described above, the construction operations were the same with these variations. This base was completed late in 1955, just after the close of aphalt season. As a result of cool weather, the emulsion was slow "breaking" and seemed to penetrate into the base leaving the surface only slightly brown. Consequently, we went to a 10 percent solution on the base surface sealing operation, which seemed to give good results.

Omitting Tack Coat

Another variation on this project which we had not previously tried, was to omit the tack coat (RC-2) ahead of the hot-mix asphatic concrete pavement. We had noted on the previous project that the tack coat was pulling the emulsified asphalt membrane, with portions of the base stuck to it where the hot-mix trucks were passing over. It was decided to see if the emulsion seal would not serve as a satisfactory tack. Insofar as we have been able to determine, the results have been excellent. You could remove a small section of the hot-mix material within a minute or so after being laid, and the emulsified asphalt had come to life and was quite "tacky". No evidence of slipping or shoving of the asphaltic concrete pavement has been observed in the subsequent 5-month period.

The 10-ft. shoulders treated late in 1955 with diluted emulsion have come through as a whole in good shape with a minimum of maintenance. The contractor was scheduled to return in the 1956 spring, to reshape the shoulders and apply a 2-course surface treatment.

● *By way of summarizing,* I would like to make these observations:

As a word of caution, care should be exercised at all times in protecting the traffic from splattering by the fresh emulsion. Traffic should be stopped outside the section where the emulsion truck is in operation, if the possibility exists that the cars will be subjected to the spray. Flagmen and signs should be stationed to keep traffic out of the freshly applied emulsion.

The splattering effect is worse on a previously treated section than on the initial application stage.

Laying-in Operation

When the treatment is used in conjunction with the laying-in operation, application should be made immediately ahead of the blade roll.

On sealing operations the diluted emulsion should be applied in half-widths and allowed to dry before traffic is routed over it. The drying time varies from 30 minutes to a couple of hours depending on weather conditions and condition of the base. The advantage of the emulsion treatment over a regular prime coat is obvious from the standpoint of the curing time element and the inconvenience to traffic.

It should be stressed that none of the steps you ordinarily take to secure a uniformly well compacted base with a good riding surface, should be eliminated due to the use of emulsion.

However, without anticipating any stabilization benefits in the use of relatively small amounts of emulsion in processing flexible bases, it would appear that we undoubtedly obtain better than ordinary compaction results due to a longer retention of the moisture in the base under traffic.

It would also appear that we gain, to some extent, waterproofing benefits in the base.

See You At the Road Show

Manufacturers' Literature

Foliar Brush Control

Complete information on foliar brush control along right-of-way systems is contained in Station Paper no. 21 released by the Field Research Section, Thompson Chemicals Corporation, 3600 Monon St., Los Angeles 27, Calif.

For more information circle 128 on Service Coupon Page 16 and mail now.

Residential Street Lighting

A new 16-page bulletin on residential street lighting is available from the General Electric Co., Schenectady 5, N. Y. The publication, designated GEA-6316, points out that 75% of all American streets are residential but that only 2% of them are adequately lighted. In addition, the bulletin states the case for adequate lighting of residential areas and describes the situation as it exists today. Profusely illustrated, the publication explains how good lighting benefits a residential community and cites case histories to illustrate the point. The guide book also provides information on how to plan modern residential lighting installations.

For more information circle 129 on Service Coupon Page 16 and mail now.

Draingrates

A revised 2-color brochure giving advantages and data on all types of riveted and pressure-locked draingrates has been published by the Irving Subway Grating Co., Inc., Long Island City 1, N.Y. The new brochure features a new type of riveted draingrate, called RI-6, which uses alternate bulb for main bearing members to allow for greater spans with less weight. Specification tables on all types have been simplified for easy use.

For more information circle 130 on Service Coupon Page 16 and mail now.

Wire Rope Sheaves

New Bulletin No. 165 available from Sauerman Bros., Inc., Dept. R-18, 620 S. 28th Ave., Bellwood, Ill., shows specifications for their Durolite sheaves carried in stock. A table gives detailed dimensions of sizes from 6 in. to 24 in. These sheaves are a basic part of Sauerman Durolite wire rope blocks and are now available as replacements in other blocks.

For more information circle 131 on Service Coupon Page 16 and mail now.

4 to 6 Ton Truck Hoists

A new catalog (Bulletin No. 1641), descriptive of Models 330 and 340 hoists has been announced by Hercules Steel Products Co., Galion, O. The new 2-page, 2-color catalog describes Hercules' 4 to 6 ton capacity hoists designed for conversion of ½ to 1 ton pickup, platform or stake trucks to multi-purpose dump trucks. Hoist construction, operation and controls are described and illustrated. A hoist capacity table and condensed specifications are also included.

For more information circle 132 on Service Coupon Page 16 and mail now.

Flasher Safety Lights and Barricades

A new 4-page catalog (LL-3143) announced by R. D. Fageol Co., Kent, O. describes and illustrates the flasher safety light line of battery-powered hazard warning lights, batteries and accesories. Companion steel and wooden barricades are also included. The catalog contains action photos, line sketches, complete descriptions and specifications, plus details of the flasher rental plan.

For more information circle 133 on Service Coupon Page 16 and mail now.

Blacktop Sealer

A new solvent-proof sealer for use on blacktop roads, parking areas and service stations is described in a bulletin available from The Gilbreth Co., 1211 Chestnut St., Philadelphia, Pa. The 4-page bulletin defines this reinforced copolymer resin sealer as offering long-lasting protection to blacktop from the solvent action of gasoline, oil and other petroleum products.

For more information circle 134 on Service Coupon Page 16 and mail now.

Flex-Beam Guard Rail

A new portfolio from Armco Drainage & Metal Products, Inc., describes in pictures and words how Armco Flex-Beam guardrail provides "safety insurance" by (1) warning of danger, (2) protecting if the warning fails. The portfolio contains reprints of various types of installations, condensed facts, sectional drawings and other illustrations. For copies, write to Product Information Service, Armco Drainage & Metal Products, Inc., Middletown, O., and mention P. O. 11056.

For more information circle 135 on Service Coupon Page 16 and mail now.

Twin-Power Scraper

A new catalog, Form 552, on the Model TS-18 twin-power scraper, released by Euclid Division, General Motors Corporation, Cleveland 17, O., explains the twin-power principle, pioneered by Euclid in the off-the-highway field in which there are two engines of 218 hp each, one in the tractor and one behind the scraper bowl, each driving an axle through a separate Torqmatic Drive. A 300 hp engine is available in the tractor where even more horsepower is desired. Action views show how hydraulic level action of apron, bowl and ejector provides fast, independent control of all

(Continued on page 163)

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. . . for more details circle 232, page 16

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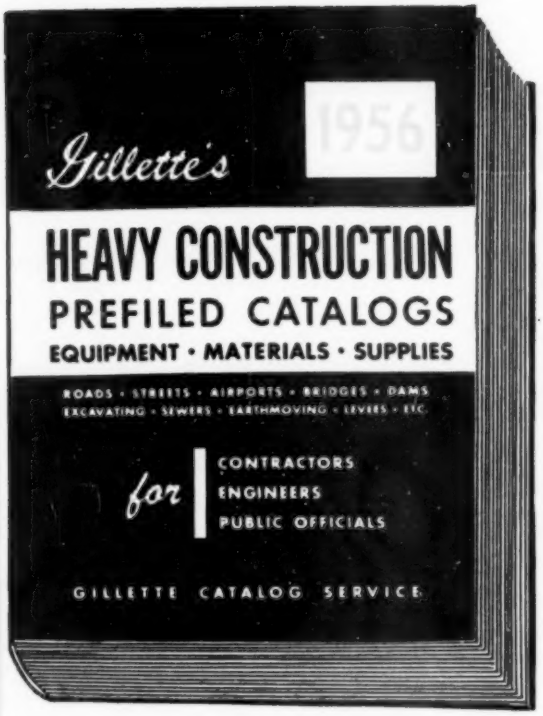

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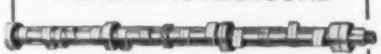

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Madsen - New 1951 - 4,000 lb. batch - All electric - 100-125 tons per hour - 250 ton, 4 compartment cold bins - Pioneer Conveyor - Madsen Dryer 84" x 24' - Hopkins low pressure burners - Madsen dust collector - three 10,000 gal. asphalt tanks - asphalt pump - all electrical equipment - ready to operate - Can be bought for moving from site or to operate where it is.

UTILITY CONSTRUCTION COMPANY

103 Bayard Street — Kilmer 5-3200
NEW BRUNSWICK, NEW JERSEY

P&H Crane

MODEL 255-A

50' boom with tagline winder (used only for coal rehandling)
13' crawlers.

WRITE, WIRE OR PHONE:
GEORGE HALL CORP.
502 Riverside Avenue
St. Lawrence County
Ogdensburg, New York
Telephone — "60"

Concrete Equipment
ALSO
Grading Equipment

3 Cement Bins connected together, total capacity 1373 bbls., Blaw-Knox Service Bin and two Johnson Silos with bucket conveyor, screw conveyors, truck dump hopper and air compressor $10,000.00
1 Cleveland Subgrader, pull type multiple blade, and scarifier, S/N 54X68, like new 2,000.00
1 Lot 1900 ft. Heltzel Road Forms, 9" high, 8" base with locks and pins, in excellent condition, per lineal ft. 1.50
2 DeWalt Radial Saws, ea. .. 400.00
3 Master Vibrators, electric, ea. 200.00
1 Hydra Hammer, 4 pneumatic tires, Wisconsin engine, S/N 625 ..... 4,500.00

Grading and Other Equipment

1 Buffalo-Springfield Roller, 10 ton, S/N 18680, w/Waukesha gas engine, a good roller.
1 5-8 Ton Buffalo-Springfield Roller, S/N 21936.
1 Parts Trailer with bins installed.
2 Cat DW10 Tractors and Model 10 Caterpillar Scrapers.
2 D8 Cat Tractors, with Angle Blades.
1 D8 Cat Tractor with push plate and Double Drum Power Unit.
1 D7 Cat Tractor with push plate and Double Drum Power Unit.
1 Model HD20 Allis-Chalmers Tractor and GarWood Angle Blade.
3 Scrapers, GarWood 25 cubic yard.
1 Air Compressor, Gardner-Denver, 210 ft.
1 Air Compressor, Worthington, 105 ft.
1 LeTourneau Ripper, heavy duty, 3 tooth.

Contact Us For Prices On Any Not Priced. All This Equipment In Good Condition And Ready To Do A Job. All Of This Equipment Is Subject To Prior Sale.

HART & HART
P. O. Box 52 - Phones 165 or 145K12
CLAY CITY, INDIANA

KEEP YOUR EQUIPMENT ROLLING

Don't Stop For Repairs Or Breakdowns!

Government Surplus . . .
GM 6-71 DIESEL Engine Assemblies

HAVE A REPLACEMENT READY TO GO

at less than it would cost you to rebuild your present equipment.
MODEL 6062-RC (Right Hand)

GOVERNMENT REBUILT TO MILITARY STANDARDS

Each engine completely preserved and export boxed. Can be adapted for almost any diesel use. Weight in shipping box is 2200 lbs.

- For replacement on Euclid or Allis-Chalmers road equipment.
- Applicable for marine work, power plants, saw mills or generators.
- Economical replacement for buses and trucks.

Spectacular Savings
LOWEST PRICE EVER!

$1600.00

Discounts in lots of five - Mail Check with Purchase Order - Credit to Rated Accounts.

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MIAMI 52, FLORIDA

FOR SALE

American #8 Road Grader Diesel Powered McCormick Deering Engine, Rear Tires size 12x38, Front Tires 7x20

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BIG BEND COLLIERIES INC.
Mr. E. E. Munger
332 So. Michigan Ave.
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GMC and CHEVROLET New Truck Parts

U.S. Navy Surplus.
Cost Government Over $10,000.
Will Sell For $1,200 in one lot.

W. E. McCarthy, Inc.
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Tel.: Mystic 6-3500

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1—800 gal. Chausse Asphalt Distributor, mounted on Chevrolet truck. New last year, ready to go. $2800.00
1—8000 gal. storage tank with pump-off hose and shut off valve $600.00

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ADOLPH HAGEMAN
Route #3 Phone 7104 W
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HEIL SCRAPER MODEL C12

12 yard capacity with cable control.
Priced to sell at..... $3,500.00

A-C DIESEL TRACTOR

Model HD14B with Double Drum Power Control Unit. Priced at..... $4,000.00

THE EARLE EQUIPMENT CO.
2424 28th St. - CH 5-9247
GRAND RAPIDS 8, MICHIGAN

USED STEEL SHEET PILING—419 pcs. Beth. DP-2, 21 ft., 28 ft. & 40 ft.; 317 pcs. Carnegie MP-11, 58 ft. and 32 ft. We buy, sell & rent all sections.
PILE HAMMERS & EXTRACTORS—4 Vulcan No. 1—MC D M & Std. Bases; 1 MC Kiernan-Terry E-2 Extractor.
R. C. STANHOPE, INC.
60 E. 42nd St. N. Y. 17, N. Y.

FOR SALE
EUCLID REAR DUMP

TRUCKS, 15, 22 & 35 Ton.
BUCYRUS-ERIE Draglines, 2½ yd to 13 yd.
BUCYRUS-ERIE Shovels, ¾ yd to 8 yd.
NORTHWEST Draglines, ¾ yd. to 2½ yd.
NORTHWEST Shovels, ¾ yd. to 2½ yd.
MANITOWOC Draglines, 2½ yd. to 5 yd.
MANITOWOC Shovels, 2½ yd. to 5 yd.
MARION Shovels & Drags, 1½ yd. to 8 yd.
LIMA Shovels & Drags, 1½ yd. to 6 yd.
OSGOOD Shovels & Drags, 1½ yd. to 2½ yd.
PAGE Draglines, 5 yd. to 8 yd.
CATERPILLAR Graders & Dozers
HI-LIFT Shovels
2400 LIMA SHOVEL FRONT attachment
4500 MANITOWOC SHOVEL FRONT attachment
6" and 9" Drills, Diesel & Electric
OTHER EQUIPMENT AVAILABLE NOT LISTED ABOVE.

WILLIAM LUBRECHT, III
Construction Equipment
311 W. Diamond Ave.,
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GRAVEL WASHERS

Two EAGLE COURSE MATERIAL SCREW WASHERS, 24" x 15', with shale removers, 15 HP 220/440 volt motor, all necessary check and gate valves, piping, etc., single deck 3' x 6' screen with spray bars and 3 HP motor. Each complete washer with screen is mounted on a single axle trailer with two new 9.00 x 20 tires. Starters for the motors are included. Will sell either or both units complete or less trailer and single screen. These washers have been used but very little and are in excellent condition. Located in our Des Moines yard.

GIBBS-COOK EQUIPMENT COMPANY
1314 Walnut St., Des Moines, Iowa
Phone CHerry 3-1176

I HAVE FOR SALE

the following: One 300 H.P. L.P. Gas Waukesha Power Unit. Complete with 85 gallon fuel tank and Radiator. Can be had with Twin Disc Power take off. This Unit is reconditioned and guaranteed, and can be had at a very low figure.

BOX 2841
PENGILLY, MINNESOTA

FOR SALE

BARBER-GREENE UNDERTRACK CONVEYOR
FAIRFIELD UNDERTRACK CONVEYOR
2 INTERNATIONAL ID 6 TRACTORS
MODEL M FARMALL TRACTOR
MODEL H FARMALL TRACTOR
BUFFALO-SPRINGFIELD 3 WHEEL 10 TON ROLLER
SEAMAN PULVIMIXER
WOODS MODEL 54 ROADMIXER
CLEAVER-BROOKS TANK CAR HEATER

Above equipment located in South Carolina

BALLENGER PAVING CO.
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GREENVILLE, SOUTH CAROLINA

EQUIPMENT
FOR SALE

1—**Bulldog Hammermill,** Model Hm-030-CF w/extra grates & hammer—Good $6,000.00
1—**Osgood Crane**—Dragline, ½ yd. Ser. No. 6520, Chrysler Motor..... $4,500.00
1—**Link Belt Speeder Backhoe** LS-51 w/Cat. D311 Motor—Needs some work $6,500.00
1—**1951-650 GMC 4 cyl. Diesel truck tractor w/winch,** rolling tail pipe, fifth wheel & steel deck—motor just overhauled $3,250.00
1—**Foote 34E Single Drum Paver** $6,500.00
1—**Dotmar Curb & Gutter Finisher**—21 In. Used Less than 60 days $950.00
1—**Woods Roadmixer,** Mod. 48 w/transmission parts for HD-14 ..... $1,000.00
1—**Buckeye 312 Wheel Ditcher** w/GMC 371 Motor Completely rebuilt $5,000.00
1—**Fuller rotary vacuum pump,** type V-70, maximum vacuum 25 lbs., Ser. No. 5391-8, with intake air cleaner, powered by 40 H.P. 6 cyl. oil field Waukesha gas motor. Used on one job only $3,150.00
1—**Fuller rotary vacuum pump,** type U200, maximum vacuum 27 in. HG, Ser. No. 5390, with air cleaner on intake, powered by 40 H.P. 6 cyl. oil field Waukesha gas motor. Used on one job only $4,500.00

H. B. ZACHRY COMPANY
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BARGAIN
HETHERINGTON & BERNER DRYER

60" x 30' complete with electric motors, cold bucket elevator, exhauster, duct work, combustion chamber, with low pressure Hauck burner, fuel oil pump.
Very good condition. Located in Northern Indiana.

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FOR SALE

Koehring #34 E. Dual Drum Paver #19910.
Lima #34 Paymaster Crane, Dragline #4831.
Lorain L-50 Crane, Dragline #20440.
Cat. #12 Grader #8T 3027.
Cat. #12 Grader #8T 706.
R B Finegrader S/N #405.
Model 848 Barber-Greene Asphalt Plant Complete.
Cat. #20 KW Light Plant.
Hopkins Low Pressure Burners.

All of above equipment located in Southeast

UNITED SOUTHERN CONTRACTORS INC.
P.O. BOX 1152
GREENVILLE, SOUTH CAROLINA

FOR SALE

34E Foote Dual Drum Paver, Ser. No. 46D-561 with 671 GMC Diesel Engine.
160 Rex Pumpcrete with Waukesha Engine and 300' misc. pipe, Ser. No. CZ363.
This equipment in good working condition and priced to sell quick.

CONLEY-LOTT-NICHOLS MACHINERY CO.
1311 South Ervay Street
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RI-6404

For Sale
HYDRAULIC CYLINDERS
Heavy Duty

316—3¼" x 10" ..... $15.00 ea.
178—5" x 12" ..... $18.00 ea.
186—4½" x 11⅝" ..... $18.00 ea.
45—4½" x 9¼" ..... $17.00 ea.
81—2½" x 20½" ..... $18.00 ea.
21—1¾" x 14" ..... $11.00 ea.
49—6" x 10" ..... $20.00 ea.
75—2¾" x 15¾" ..... $15.00 ea.

Cylinders are used but in good condition. Prices quoted are about ⅓ the price of new ones.
Check w/order, deduct 5% discount.

PHILADELPHIA TRANSFORMER CO.
Box 566 Dalton, Pa.

FOR SALE

2-Gardner-Denver 500 cfm Compressors
1-Barber-Greene Model 848 Heavy Duty Travel Plant (Loader and Pug Mill).
1-Buffalo-Springfield 8 to 12 ton tandem flat wheeled roller.
Several 11-wheeled pneumatic tired rollers.

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FOR SALE—Small construction company licensed to bid in North and South Carolina. All equipment and supplies that are needed for a complete small general construction company. A going concern. Equipment itself worth more than selling price.

Write Box 1179, Roads & Streets, 22 W. Maple St., Chicago 10, Ill.

WANTED

SHOVELS AND DRAGLINES
To be from very large to small machines

EUCLID TRUCKS
Need all sizes—rear dump trucks

Please advise price, serial numbers, mechanical condition and other pertinent information.

We pay cash for your equipment

FRANK SWABB EQUIPMENT CO., INC.
313 Hazleton Nat'l. Bank Bldg.
Hazleton, Pa. GLadstone 5-3658

FOR SALE

1—Caterpillar D-6 Dozer
Excellent condition
Priced to sell

1—Caterpillar D-7 Dozer
Excellent condition
Low hours
Priced right

514 Unit ½ yard Backhoe
Priced right

1—Galion 101 Motor Grader
Power steering
Diesel engine
Cab, lights & scarifier
Very good condition
Low Price

WERCKLE CONSTRUCTION EQUIPMENT CO.
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Rockford, Illinois

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LATE MODELS MIDWEST LOCATIONS

Manitowoc 3000-B's, 3500's erect cranes — shovels, long booms, wide long cats diesel. Also 2000-B's.

Northwest 6's, 80-D's, and 95 cranes — drags — shovels, diesels, wide long cats — long booms. Ind. BH's.

Bucyrus-Erie 38-B's, 51-B's, 54-B's, cranes — drags, shovels, diesels, wide long cats — long booms.

Marion, Koehring, Link Belt & Lorain models cranes — drags — shovels, wide long cats — diesels. Also backhoe equipped machines, all types.

JAMES C. FRENCH
226 Berry Pkwy. - Talcott 3-4927
PARK RIDGE, ILLINOIS

1955 TERRATRAC

GT 32 complete with loader, Pippin Backhoe and Trailer
A-1 condition—$5,000

BACKHOE

Badger Hopto No. 105
Self-powered on 1948 Studebaker
Best Offer

AIR COMPRESSOR

Ingersoll-Rand 105 cu. ft.
A-1 condition—$1,300

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SHOVEL—NEW 1954

P&H Model 955 with a
2½ Yd. Rock Dipper *OR*
3½ Yd. Coal Loading Dipper,
Waukesha 225 H.P. Diesel Engine
and Torque Converter and Magnatorque

PRICED TO SELL

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Phone: LEhigh 1-6020

FOR SALE

Barber-Greene 840 B Plant Continuous mix: 20 to 45 tons per hour

Bros HO-20 Hot Oil Heater

10,000 gallon Storage Tanks

Littleford DLC 1,000 gallon Distributor mounted on truck

Littleford 108 Broom

Buffalo Springfield KT 19 A8—8-12 ton Roller

Fairbanks Morse 12237 20 ton Scale

HiWay R Spreader

HiWay AS Spreader

All new in 1955, also:
1956 Bros SP-54 Self-Propelled Roller

Particulars and prices upon request:

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ARMY SURPLUS BARGAIN

1—D7 Ser. #3T-17348 Cat. 24 Angle dozer, Army Surplus. Used 1,000 hrs. $9,500

1—Link-Belt LS-85 ¾ yard, used 500 hours, Cat. 8800 Diesel. $11,000.00

1—Bay City 180T50 Truck Crane, 80 ft. Boom, 30 ft. Jib. $17,000.00

1—Lorain MC-4 Motor Crane, No. 13887, 30 ft. Boom $13,000.00

1—1953 Jaeger—600 CFM portable Compressor, Diesel, on rubber, used 2000 hours $6,500.00

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UDELSON TRUCK SALES, INC.
3210 Woodland Ave., Cleveland, O.
Superior 1-1666

UNDER CAR UNLOADERS, CONVEYOR TYPE, FAIRFIELD MODEL 134,
Gasoline Engine Powered, Self Propelled, Price $450.00
F.O.B. Photographs Available
L & L SURPLUS 2222 Oriskany St.
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FOR SALE
CRUSHING PLANT

BARGAIN

Diamond Portable 15x36 Jaws
20x24 Rolls — One Unit — Approx. 25 Tons
Heavy Steel Wheels — Excellent
Also Several Smaller Plants

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FOR SALE—
COMPLETE GRAVEL PLANT OPERATION

Consisting of 15 year mineral lease with real estate and all washing and screening equipment. Cranes, belt conveyors, water pumps, front-end loaders, trucks and aggregate bins.

Satisfactory offer to exceed appraised price.

KITTS GRAVEL COMPANY
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Highest dollar value paid for new and used trucks and all kinds of used equipment. All types of truck equipment bought and sold, including war surplus.

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Vandeventer Auto Sales
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Ph. FRanklin 1-1750

FOR SALE or RENT

Christian 2D Hoist & Swinger, 128 HP Buda Diesel Engine. 15,000# SLP.
2 100 HP Lucey Portable Horiz. Fire-Box Boilers. 200 lbs. Oil Fired. ASME.
25 ton American Steel Guy Derrick.
30 Ton Steel Stiffleg Derricks 125' bm.
25 ton Ohio Diesel Loco. Crane 1947.
1½ yd. Northwest No. 6 Diesel Crane 1948.
1½ yd. Bucyrus-Erie 38-B Diesel Crane 1948.
½ yd. Manitowoc 4500 Shovel-Dragline.
75KW Cat. Diesel Generator 3/60/440.

MISSISSIPPI VALLEY EQUIPMENT CO.
515 Locust St.
ST. LOUIS 1, MO.

FOR SALE

(1) Atlas Imperial Diesel Electric Set. New Engine, Rebuilt Generator.
Atlas engine Model #8EN668, HP 320, RPM 600, 9x10½ air start. With automatic alarm, shut down equipment, Woodward governor, air compressor and tank, cooling tower, etc. Direct connected to 250 KVA rebuilt Ideal Generator pedestal type. 120/240/480 volts, 200 KW, @ 80% PF, KVA 250, 60 cycle, 3 phase, Amps 300, Exciter 5 KW, 125 volts, with complete switch panel. Atlas Engine has 30 hours total time since new. Generator completely rebuilt. Unit available for immediate delivery.

(2) Fairbanks-Morse 300 KVA Diesel Electric Sets.
Engine Model #32, RPM 360, 6 cylinder, 2 cycle, Serial #699333-703739, Direct connected to F. M. 2400 volts, 3 phase, 60 cycle generator with switch panel. Excellent cond., can be seen in operation. $16,000.00 for the pair.

(1) 6-110 GMC Diesel Electric Set.
100 KW, 110/220/440 volts, 3 phase, 60 cycle with switch panel. Radiator cooled, steel skid mounted, Delco Generator. Engine and Generator completely rebuilt, guaranteed. $5,500.

(2) New 40 KW International UD16 Diesel Electric Sets.
With Palmer self regulating Generators. 110/220/440 volts, 3 phase, AC 60 cycle. List $6,000.00 ea. For quick sale at $3,-250.00 ea. New guarantee.

Equipment Supply Co.
444 Blackstone Avenue
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Phone: Amhurst 6-9781—4-8933

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Deister double deck vibrating screen, 4 ft. x 8 ft. with 5 hp. 220/-440 volt electric motor and starter, $2,250.00.

10" Speedway electric saw — reconditioned, $85.00.

300 amp. Lincoln gasoline engine driven portable welder, $650.00.

60 cu. ft. Joy portable air compressor, $950.00.

2 ton capacity Yale & Towne spur geared chain hoist, $150.00.

Beach 16" tilting table saw with gasoline engine, $145.00.

Stow gasoline engine driven flexible shaft portable concrete rubbing unit, $100.00.

LEE MATHEWS MACHINERY & RENTAL CO.
308-318 Broadway BA. 1-0650
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WIRE ROPE

100,000 FEET
⅜", 6 x 37 Improved plow galvanized wire rope cable, regular lay.

80,000 FEET
¾", 6 x 19 Improved plow, uncoated, wire rope center, preformed, regular lay cable.

250,000 FEET
½", 6 x 19 Fibre core, preformed, regular lay, mild plow wire rope cable.

200,000 FEET
¼", 6 x 19 Improved plow black wire rope cable.

150,000 FEET
7/16", 6 x 19 Galvanized, Improved plow wire rope cable.

150,000 FEET
7/32", 7 x 19 Aircraft Galvanized Aircraft wire rope cable.

Write, wire or phone for quantity prices.

ATLAS EQUIPMENT CO.
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KANSAS CITY, MISSOURI

WANTED

Gantry Cranes, 15 ton
300 kw MG set
75 kw MG set
3500 Manitowoc shovel
Hoist, zdrum-60,000#
Harris Power Horse

Try our information exchange

BRIGHT DAY SERVICES, INC.
Reynolds Bldg., Kittanning, Pa.

STEEL SHEET PILING

178 Tons Carnegie MZ-127—30' to 37'
418 Tons Bethlehem AP-3, DP-2—30' & 40'
All Sections Bought, Sold, Rented

SEABOARD STEEL CORP.
4521 S. TAMIAMI TRAIL, SARASOTA, FLA.

FOR SALE By Owner

25 Northwest with shovel front & boom. Serial No. 13540, GM diesel. In good condition.

Sale & Alexander
Box 702 - Waynesville, N. C.

FOR SALE BY OPERATION

TRUCKS:

(All With 10 Ton Dump Bodies)
Macks Have Dual Rear Axles

1—1952 Mack A40S, Serial #8283, Engine #EN377-65-92 ..... $5,000.00
2—1950 EQ2D, Serial #2297—Engine 431A-21-47, Serial #2298—Engine 431A-21-90—each $2,750.00
5—Internationals, KBR 11, ea. .. $ 850.00
3—Internationals, KBR 11, ea. .. $ 650.00
1—1948 Dodge Flat Bed Truck, 1½ ton ..... $ 500.00
1—1945 Ford Wrecker Truck .. $ 550.00
1—1948 GMC, 1½ ton Dump .. $ 550.00

Write or Call

BIG BEND COLLIERIES, INC.

Mr. E. E. Munger
332 So. Michigan Ave.
Ph. Harrison 7-0250

SNOW REMOVAL

ROTARY SNOW PLOWS, OSHKOSH 7½ ton 4x4s with Klauer Model TU-3 Rotary Plows—overhauled—ready to work—3 units available.
Also unused parts for R61 Climax Engine.
WALTERS, all wheel drive, **SNO-FIGHTER,** with **FRINK** snow removal blade with blower, unit like new.

Write, wire or call for further information.

WITTENBERG MOTOR CO.

2010-15th Ave. West, Seattle, Wash. **Garfield 1651**

FOR SALE

1 Complete Shovel Front for TL25K Lorain, just like new. F.O.B. Oklahoma City $1,750.00

1 Backhoe Attachment complete for TL25K Lorain, with 30" bucket and extra 36" bucket, just like new. F.O.B. Oklahoma City 1,750.00

1 Koehring WD-60 Dumptor, S/N 2661, GMC 4-71 power. Good condition. F.O.B. Oklahoma City 6,500.00

1 Model C 1952 Tournapull with GMC 6-71, and 1 model C 1953 Tournapull with completely rebuilt Buda Engine Model 6DA-844, both in very good condition, F.O.B. Oklahoma City, for ..... ea. 6,500.00

Butler-Sparks Equip. Co.

Phone Regent 6-5585 - P. O. Box 675
OKLAHOMA CITY, OKLAHOMA

ASPHALT DISTRIBUTOR

LITTLEFORD, Model CLRA, 1050 gallon distributor with 14' spray bar, mounted on INTERNATIONAL 2½ ton 6 x 6 truck. Excellent Condition.

PRIESTER MACHINERY COMPANY
249 South Third Street Memphis, Tennessee
Telephone: JAckson 5-6885

FOR SALE

1 6x6 Diamond T front winch, excellent mechanical condition.
2 2 Ton Dodge Dumps.
1 3 Ton International Dump.
1 2 Ton Ford Dump.

We have for sale a large stock of New FEDERAL TRUCK PARTS

Clark Transmission Parts.
Timken rear-end parts & bearings.
2500 Cyclone oil filters.
New Radiator Assemblies.
Steam Hose coupling and air hose coupling.
Clutch and engine parts.

ALSO, Large supply of off the road Engine Equipment Parts.

24 hour service.

Terminal Auto Parts

200 Block of West Depot - Phone 2-5135
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OSHKOSH DUMPS

Two Oshkosh Dump Trucks, four wheel drive. 1952 Model WA 703, eight ton, four yard bodies, standard trucks, closed cabs. Air brakes. - These trucks were used by: U.S. Atomic Energy Comm., Government surplus.

PRICE - $3,800 Each.

W. E. McCarthy, Inc.

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Tel.: Mystic 6-3500

BARBER-GREENE ASPHALT PLANT For Sale

1—848-SN 1654 Mixer (Volume 3" below top 55.1) A5-848-232W (Mfg. 7-16-54)
1—811 A Fines Feeder
1—880-18'-3" Hot Elevator with dolly
1—866 Graduation Unit
1—880-27'-6" Hot Elevator with dolly
1—837-954 Low Pressure Dryer
1—847 Dust Collector
1—24" x 39" Conveyor
1—813 Feeder with steel housing
1—Asphalt Meter

The above is priced at $75,000.

If the following is included, the price is $85,000.

1—10,000 gal. Asphalt Tank
1—4,000 gal. Fuel Oil Storage Tank
1—Set Asphalt Piping
1—C100 Childers Hot Oil Heater (new 7-1-55)

The above plant has had 49,000 tons put through it since it was new and is in excellent condition.

INLAND ASPHALT CO.
P. O. Box 4116, Station B.
10th & Havana
Spokane 31, Washington

FOR SALE

NEARLY NEW CONCRETE BATCHING PLANT - USED ONLY 40 DAYS

Fully Automatic Noble Plant, Purchased For Specific Job Just Completed.

OUTSTANDING FEATURES INCLUDE:

150 ton, 3 compartment aggregate bin.
Two 500 barrel elevated cement silos.
Two cement feed screws.
3½ yard weigh hopper—separate cement scale.
Two cement or flyash bucket elevators (320 barrels capacity each per hour) with 12 inch receiving screws and railroad shroud type receiving hopper. (Will sell only one, if desired.)
Ladders with safety guards to top of silos.
Electrical panel with fused disconnect switches and magnetic starters for each motor. Entire plant wired with plug type connectors.
300 gallon automatic water scale.

Quickly convertible to either central mix or transit mix installation.

Capacity To Mixer Trucks Over 100 Cubic Yards Per Hour.

Immediately Available - F.O.B. Camden, N. J.

INTRUSION-PREPAKT, INC.
Union Commerce Bldg. - CHerry 1-1750
CLEVELAND 14, OHIO

HEAVY MACHINERY HAULING

Full Equipment to Handle Any Job

MUSKE MACHINERY CARTAGE, INC.
Franklin Grove, Ill. Phone 128

FOR SALE VERY CHEAP

Bulldozers, Angle & Straight, Cable Controls & Hydraulic Attachments.

Wrecking Now - Following Tractors For Parts:

Caterpillars: D-2, D-4, D-6, D-7 and D-8
Allis-Chalmers: HD-7, HD-10, HD-14, L & S
Internationals: TD-9, TD-14, TD-18
Cletracs: All Models

We now have operating latest type automatic track, roller and idler rebuilding equipment. We can furnish rebuilt tracks, rollers and idlers at lowest prices. Bring or send your old track, rollers and idlers for credit on exchange. Also, can rebuild yours, at greater savings - Fully guaranteed - Quality workmanship.

Also Parts and Tires for Allis-Chalmers, Caterpillar, Adams, Motor Graders.

WE TRADE - WE BUY - WE SELL

1957 Catalog Now Ready
Send 25c - Refundable.

SURPLUS TRACTOR PARTS CORP.
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The World's Largest Dealer In Quality Used Construction Equipment

now ready to serve your needs!

John Fabick Tractor Co.—a Caterpillar dealer has assembled the most-complete selection of used construction equipment in the world. Machines of every type, make, price and condition are "in-stock". Many are backed by a $10,000 performance bond. Whatever you need, whatever you want to pay, wherever you want it shipped—Fabick can help you! Write, wire or phone—today—for a complete listing or for information on a specific machine.

Here's an example . . .

Cat No. 70 Scraper (SN8C1480)—10 cu. yds. struck; 13 cu. yds. heaped. Tires: 6.00 x 24—16 ply front; 21.00 x 24 rear. Good operating condition. F. O. B. Sikeston, Mo. $6950.

Allis-Chalmers AD-3 Motor Grader (SN1F60)—Tandem drive diesel. 12' moldboard. Hyd. brakes. Leaning front axle. Elec. starting. Tires: 9.00 x 24—10 ply front; 13.00 x 24 rear. Good operating condition. F. O. B. Marion, Ill. $1975.

JOHN FABICK TRACTOR CO.
A CATERPILLAR DEALER
3100 GRAVOIS AVENUE — ST. LOUIS 1, MISSOURI, U. S. A.
PHONE PR 2-8900
Cat and Caterpillar are registered trademarks—®

FOR SALE

1 Buffalo—Springfield Roller Model KT-24B, Gas Power, New in 1949—overhauled.

1 Barber-Greene Model 82-A Bucket Loader w/Buda Gas serial 82A-9-77 overhauled.

1 Barber-Greene 879A Finisher Le Roi Gas Power, new in 1955.

1 D-6 Cat Dozer & P.C.U. new in 1955.

ANDERSON EQUIPMENT CO., INC.
306 South Virginia St.
Sioux City, Iowa — Ph. 5-0462

EQUIPMENT FOR SALE

1—Farrel Crusher, size 20x10B	$ 495.00
1—Farrel Crusher, size 20x6B	295.00
1—Jeffery Flex Tooth Crusher, size 36x24	745.00
1—Dixie Flex Tooth Crusher, size 26x22	495.00
1—Traylor Crusher, size 18x36	3,495.00
1—Jeffery Mfg. Co. Vibrator, type 5, 30x70	950.00
2—Jeffery Mfg. Co. Vibrators, type FB2, 40x70. Each	950.00
1—Journal Lathe, Niles Tool Wks. Co.	1,000.00
1—Magnaflux model ZB 23, black light for Zyglo or Magnaglo inspection material	950.00
1—1½ Yard Gar Bros. Concrete Bucket	445.00
1—30'x24" Portable Conveyor with electric motor, General Conveyor Company	1,295.00
1—Air Receiving Tank, 125# work pressure, 650° work temperature, Code stamped with 3 pressure relief valves. Tank 168" long, 54" dia.	950.00
3—Dings Magnetic Separators, Ea.	100.00

Baron Iron & Equipment Co.
P. O. Box 104, Sta. D - Atlanta 18, Ga.

FOR SALE

Model 54 Wood Roadmixer: Serial #135, complete w/Power Take Off and Controls, for D8 Tractor. Excellent condition...$4,000.00

Model 5 Northwest Dragline, Serial #6241, 50' boom, 1½ yard Page bucket, D13000 Cat engine. Reconditioned.....$10,000.00

Northwest 25 Shovel Front Gov't Surplus. Like new $350.00

Model 79 Lorain Backhoe Attachment $2,500.00

Hystaway Dragline for D8, D7..$1,500.00 Each

WE BUY - SELL - RENT
Tractors - Rubber Tired Earthmovers - Graders - Carryalls - Tampers

LOS ANGELES TRACTOR & EQUIPMENT CO.
Los Angeles 2, California
2221 Firestone Blvd. - LUdlow 7-3258

FOR SALE

Sargent M-410 ⅜ yd. Basic Unit, #10379, Oliver Diesel engine, 25' x 10' boom; on 375 Zeligson Carrier

Quickway Model 105A 5/10 yd. Basic Unit, #14060, Continental F-233 engine; on Model 1066 Crane Carrier

Buckeye Model 308 Utility Ditcher, #153, Chrysler gasoline engine, equipped we to dig 20" wide, 5'6" deep

All above equipment new in June and July, 1956

Murphy Model 24 Diesel engine, 232 hp @ 1200 rpm; heat exchangers; twin disc enclosed clutch; flexible coupling, extended shaft with two outboard bearings. New—never been used. For sale at less than dealer's cost.

Fairbanks-Morse Centrifugal pump, 10" suction, 8" discharge, 75 hp F-M Motor, 2000 gpm @ 115' head. Excellent condition

Link Belt LS 85 Shovel-Dragline combination, #7A1024, Cat engine. Fair condition. Priced to sell

Barber-Greene 44-B Trencher, dig 5'6" deep, 18" wide. Good operating condition.

Tri-State Equipment Co., Inc.
520 Mulberry — Jackson 5-3716
Memphis, Tenn.

FOR SALE

ONE USED HYSTER TOWING WINCH, Serial Number not available. Probably a 1944 model. Good working condition.

ONE USED LUFKIN TOWING WINCH, Model 60, Serial Number 627 for TD-14 Crawler Tractor.

RISH EQUIPMENT COMPANY
P. O. Box 120—Annex Station
Cincinnati 14, Ohio

EXCEPTIONAL TIRE BARGAINS

(For a Limited Time Only)

1100-20-14 ply New Highway Type	$35.00
1400-24-20 ply Army Tread 65	85.70
Tread Showing excellent condition. Airplane Tire for Conversion	70.00
1550-20-14-16-20 ply Good Used	12.50
1700-20-16-20 ply Good Used	20.00
1700-16-12 ply Good Used	20.00
65" Used Good	50.00
56" Used Good	15.00
56" New	30.00
2500-28-30 ply Good Used	100.00

TIRE SALVAGE CO.
148 No. Cypress Ave.
SAN JOSE, CALIFORNIA

FIFTEENTH ANNIVERSARY SALE
Seven Cranes & Shovels

Marion "331" ¾ yd. Shovel or Crane.
P&H "255A" ¾ yd. Diesel Shovel.
Insley "K-12" ½ yd. Trench Hoes or Draglines (3).
Lorain "TL-20" ½ yd. Dragline or Trench Hoe, Reconditioned.
Unit "514" ½ yd. Trench Hoe, fair condition.
Link-Belt Shovel Attachment complete, for LS-85 (¾ yd.)

FOUR TRANSIT MIXERS

Jaeger 3 yd. (4¼ yd. Agitator) Hi-Discharge, 1945-1947 Models, one mounted on 6-Wheeler, one un-mounted.
Smith 3 yd. (4¼ yd. Agitator) Hi-Discharge, un-mounted.
Rex 3 yd. (4¼ yd. Agitator) Hi-Discharge, mounted F-8 Ford Tandem.
Rex 3 yd. (4¼ yd. Agitator) Hi-Discharge, mounted I-H "LF174" Tandem.

SIX END LOADERS

Caterpillar "D-6" Diesel Tractor, Traxcavator Loader, Cab, 1950 model—excellent.
Caterpillar "D-6" Diesel Tractor w/Traxcavator. Needs some track repairs.
Cletrac "DGH" Used Gas Crawler w/Drott Hi-Lift 1½ yd. Front End Loader. Needs some track work. Make Offer!
Hough "HM" 1½ yd. Four-Wheel Drive Payloader, Reconditioned.
Pettibone "15" 1½ yd. Four Wheel Drive Tractor Shovel.
Pettibone "175D" Demonstrator 1¾ yd. (Struck) Tractor Shovel, 4-wheel drive, power shift transmission, planetary axles. New Guarantee.

MISCELLANEOUS

Barber-Greene "522W" Bucket Loader, rubber-tired, reduced to sell.
Adams "411" Diesel Motor Grader, Cab and Scarifier.
Barber-Greene "705" RT Runabout Ditcher, digs 4½ ft. deep.
Chicago Pneumatic "60" Reconditioned Portable Compressor. We have 3 of these from $800 to $1250.
Universal "2036" R.B. Jaw Crusher, skid-mounted, w/Apron Feeder.
Bayport 23 yd. New Aggregate Bins.
Caterpillar "D318" Diesel Electric Generator Set, 40 KW.
Caterpillar "D13000" Diesel Power Unit.
Jahn 15-Ton Low Boy Semi-Trailer, flat deck, Vacuum Brakes.

NOTE: All This Equipment Located in our Yard.

EIGHMY EQUIPMENT COMPANY
120 S. Pierpont Phone 4-6706
ROCKFORD, ILLINOIS

FOR SALE

3 - #12 Caterpillar Motor Graders, 8T Series.
3 - D-7 Caterpillar Tractors with Dozer and DDPCU - 3T Series.
1 - D17 Caterpillar with Dozer and DDPCU - 7AC Series.
1 - #955 Caterpillar Loader - 12A Series.
1 - Gardner-Denver Compressor 210, mounted on 1950 F6 Ford Truck.
2 - #60 Caterpillar Scrapers.
1 - 300 Amp Wilson Welder mounted on 1947 Chevrolet Truck.
1 - 1956 F-6 Ford Truck with a Flat Bed Dump.
1 - 1956 F-6 Ford Dump Truck.
1 - 1953 GMC Pick-up with half ton Utility Bed.
2 - 1956 F-1 Ford Pick-ups.
1 - 1956 GMC 650 Tractor.
1 - 1956 Dorsey Lowboy Trailer.
1 - 1945 Fruehauf 28 Foot Tool Trailer.
1 - Athey Belt Loader.
1 - Caterpillar #18 Ripper.

Miscellaneous Jack Hammers, Light Plant, Chain Saw, Concrete Mixer, etc.

SHOFFNER & SONS CONSTRUCTION CO.
747 South Fairway Terrace - Springfield, Missouri

FOR SALE

4—"C" Tournapulls—A1.
1—L.P. 2-wheel Hyd. Scraper, 8 yards.
1—Model MC1 Hughes Keenan Roustabout Crane, with ½ yd. Cowen bucket.
1—Cedarapids Revolving Screen. 6 ft. diam., 5 ft. Scrubber, 13 ft. Screen, 12 ft. Sand Jacket, complete w/drive and spray bars.
1—4 ft. Cedarapids Sand Drag.
1—New CRC 30" Pipe Bending Machine.

AKRON CONTRACTORS EQUIPMENT
P. O. Box 5283 Akron 13, Ohio
UNiversity 4-0580

FOR SALE

HD-10 ALLIS-CHALMERS DOZER with 9½ foot blade; double winches; equipped with GM-470 Diesel engine completely overhauled; new main and rod bearings; new sleeves; pistons; rings; valves and injectors; all bushings and pins renewed where necessary; all tracks, idlers and sprockets built up with high tensile welding rod; seals renewed in rear wheels; new batteries. Ready for immediate service. Will demonstrate locally. Price $6,500.00 FOB Mobile, Ala. Call collect. W. E. Carr, Phone HE-32696.

Carr White Truck Co., Inc.
809 Virginia St.
MOBILE, ALA.

DEPENDABLE USED MACHINES
Northwest 1 yd. crane Insley K-12 backhoe
P&H 255A dragline Jeep-a-Trench
Harris 2½ yd. Power Horse
Pioneer port. gravel plant
TRACTOR & EQUIPMENT CO.
10052 Southwest Highway, Oak Lawn, Ill.

BRIDGES FOR RENT

Bailey Steel Truss Type
Portable & Fully Prefabricated
Variable Span & Capacity
Cantilever Erection

Excellent For

Construction detours — Contractors' access
Emergency detours — Temporary overcrossings — Traffic separation

BAILEY BRIDGE EQUIPMENT CO.
1767 Conejo Ave., San Luis Obispo, Calif.

UNITED
TRACTOR PARTS
...NEW ONLY

FOR THE FOLLOWING MODELS
CRAWLER TRACTORS

CATERPILLAR
D2, D4, RD4, D6, RD6, D7, RD7, D8, RD8

INTERNATIONAL
T6, TD6, T9, TD9, T14, TD14, TD14A, TD18, TD18A, TD24

ALLIS CHALMERS
HD5, HD7, HD9, HD10, HD14, HD15, HD19-20

- ★ TRACK CHAIN
- ★ TRACK PINS & BUSHINGS
- ★ TRACK CHAIN LINKS
- ★ TRACK ROLLERS COMPLETE
- ★ TRACK ROLLER PARTS
- ★ TRACK IDLER COMPLETE
- ★ TRACK PRESS MACHINES
- ★ PORTABLE PRESS MACHINES
- ★ ROLLER SEALS
- ★ UPPER CARRIER ROLLERS
- ★ BEARINGS, ALL SIZES
- ★ DRIVE SPROCKET COMPLETE
- ★ FINAL DRIVE GEARS
- ★ FINAL DRIVE PINIONS
- ★ TRANSMISSION GEARS
- ★ TRANSMISSION PINIONS
- ★ TOP CARRIER ROLLERS
- ★ NUTS AND BOLTS

QUALITY GUARANTEED

Large Stock of Listed Parts Available for
IMMEDIATE DELIVERY
WAREHOUSES: MINNEAPOLIS—NEW YORK

PARTS AND PRICE LIST AVAILABLE
ATTRACTIVE DISCOUNTS QUOTED

UNITED TRACTOR PARTS CO.

PHONE: FEderal 8-4418
1406 3rd Ave. So.
Minneapolis, Minnesota

PHONE: PEnn 6-6656
Suite 1646 11 West 42nd St.
New York, N.Y.

CABLE: TRACPAR

100% Self-Contained

POWER TOOLS

by SYNTRON

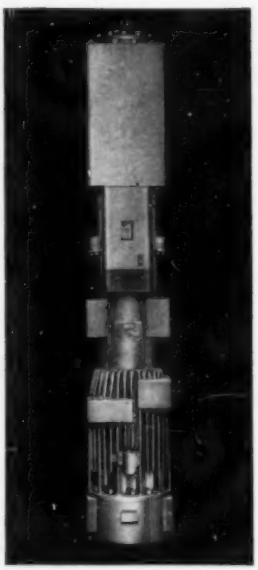
the leader in Self-Contained Equipment

Gasoline Hammer ROCK DRILL

High speed drilling up to 2-ft. per minute. Automatic rotation of drill steels. Cleans holes to depths of 13 ft. One man operation easily portable over rough terrain. 100% self-contained —no auxiliary equipment.

DIESEL PILE HAMMER

100% self-contained — no auxiliary power needed. Syntron Diesel Pile Hammers are heavy-duty, ruggedly constructed for driving concrete, steel or wood piling under almost any conditions—backed by a proven record for ability and dependability in this field. Quick conversion of crane to mobile pile driving rig. Made in 3 sizes with capacities of 5,000, 12,000 and 20,000 foot pounds per blow.



Gasoline Hammer PAVING BREAKER

Rugged, economical, 100% self-contained unit. No air compresser needed. Easily portable—one-man operation. 2,000 powerful blows per minute, governor controlled—no air compressor, hose or batteries.

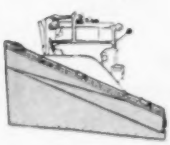
All Syntron self-contained power tools are known for their portability, power and rugged construction. This adds up to long dependable service on job after job with little or no maintenance.

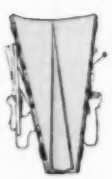
SYNTRON COMPANY

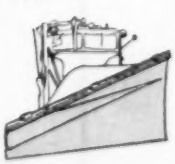
384 Lexington Ave. Homer City, Penna.

. . . for more details circle 254, page 16

For Airports and Dual Highways







The Frink Taper Blade Roll-Over Sno-Plow combines the advantages of the reversible blade type with higher speed, deeper snow handling qualities of the one-way plow.

This plow throws and spreads the snow, yet can be hydraulically rotated from left hand to right hand plowing position in 15 seconds, enabling the operator to throw *all* the snow in the most favorable direction as dictated by the wind or the location of the disposal area.

Deadheading is eliminated, therefore, less equipment is needed. Parking is easier, because the truck can be parked with the Roll-Over in the upright position within its own width.

The Frink V-Type, One-Way Type, and Reversible Type Sno-Plows can all be attached to the Roll-Over Lifting Device Assembly.

FRINK SNO-PLOWS

Clayton, 1000 Islands, New York

Made in Canada by

Frink Sno-Plows of Canada, Ltd., Toronto, Ontario

. . . for more details circle 205, page 16

Manufacturers' Literature

(Continued from page 149)

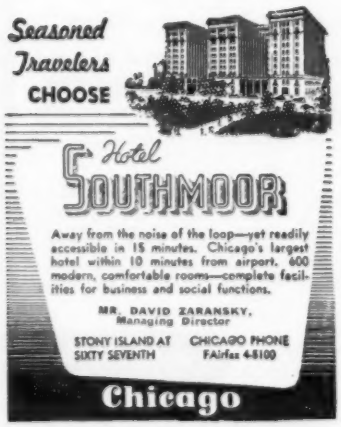
scraper operations. Condensed specifications and a performance graph are included in the catalog to provide data on engines, transmissions, tires, scraper controls, weights and dimensions, speeds and grade ability.

For more information circle 136 on Service Coupon Page 16 and mail now.

Gyro-Vise

Two bulletins, descriptive of its new Gyro-Vise No. 73½, announced by The Columbian Vise & Mfg. Co., 9023 Bessemer Ave., Cleveland 4, O., describe new vise features in detail. Emphasis is placed particularly on the increased jaw width of 5½ in. Vises are also equipped with removable and replacable pipe jaws, having a capacity of ⅛ in. to 1½ in.

For more information circle 137 on Service Coupon Page 16 and mail now.


Seasoned Travelers
CHOOSE
Hotel
SOUTHMOOR
Away from the noise of the loop—yet readily accessible in 15 minutes. Chicago's largest hotel within 10 minutes from airport. 600 modern, comfortable rooms—complete facilities for business and social functions.
MR. DAVID ZARANSKY,
Managing Director
STONY ISLAND AT SIXTY SEVENTH
CHICAGO PHONE FAirfax 4-8100
Chicago

Road Grader

A well-illustrated and informative catalog (No. 415) on the Galion Model T-600 Grade-O-Matic Grader is available from The Galion Iron Works & Mfg. Co., Galion, O. The many advantages of the torque converter drive and power-shift transmission, which increase work production and simplify operation of this 140 hp., 30,420 lb. grader, are fully explained. The many other features of design and construction, as well as the many attachments available, are also interestingly presented.

For more information circle 138 on Service Coupon Page 16 and mail now.

Snow Removal Equipment

A new mailing piece (MS-1147) issued by Tractor Group, Allis-Chalmers Manufacturing Co., Box 512, Milwaukee 1, Wis., lists a wide range of snow removal equipment for a wide variety of snow removal jobs. Illustrations of the equipment and brief specifications are included.

For more information circle 139 on Service Coupon Page 16 and mail now.

Operator's Guide for Tractors and Scrapers

A comprehensive operator's guide for Caterpillar wheel tractors and scrapers has been published by Caterpillar Tractor Co., Peoria, Ill. The 24-page booklet (Form 32022) describes the proper operation of rubber-tired earthmovers in all phases of their work. In helping operators gain proficiency, the booklet is written in terms of operator benefits—easier operation and rewarding performance. Since bigger payloads and faster hauls are important to both the owner and operator, detailed tips on loading, hauling, dumping, and returning are included. Operator ease is stressed in an explanation of proper shifting and use of the scraper controls. Color pictures further explain important facts about the earthmoving cycle. To enable an operator to quickly grasp basic service checks on his equipment, the booklet includes an easily understood checklist of important pre-operation checks.

For more information circle 140 on Service Coupon Page 16 and mail now.

Mechanical Handling of Construction Material

New 12-page booklet offered by American Tractor Corp., Churubusco, Ind., contains helpful suggestions on mechanized handling of construction materials. Reprints of job-story advertisements which have appeared in various trade publications during the past year explain how successful contractors are using crawler-mounted TerraTrac fok lifts, with quick-change attachments, to cut handling costs and speed-up movement of materials in mud, snow and rough terrain, with reported savings up to 10 per cent.

For more information circle 141 on Service Coupon Page 16 and mail now.

Avoid One Cause of Air Line Leaks and Pressure Loss
"BOSS"
Self-Honing
AIR VALVES
"BOSS"
DIXON VALCO
Female I. P. T.
Both Ends
Built to withstand the hard knocks of mining and construction service, "BOSS" Valves are also ideal for general use on pipe lines, hose lines, compressor tanks, etc., and for the handling of water. They do not require packing.
Bronze plug firmly seated by spring tension against harder metal of valve body is automatically honed to perfect seat as handle is turned. A straight, full-flow opening extends through valve body and plug, providing greater capacity with no friction loss. Valve opens or closes by a quarter turn of the handle.
INTERNALLY ATTACHED HANDLE—
In sizes ¾" to 1½" valve stem and handle are combined in a strong one-piece forged steel unit which is anchored to the bronze plug within the valve body. This patented feature eliminates stem and handle breakage. Sizes ¼", ⅜", ½" and 2" have externally riveted handles.
Male I. P. T. Both Ends
Stocked by Manufacturers and Distributors of Industrial Rubber Products
DIXON
Valve & Coupling Co.
GENERAL OFFICES & FACTORY—PHILADELPHIA 22, PA.
BRANCHES—CHICAGO · BIRMINGHAM · LOS ANGELES · HOUSTON
DIXON VALVE & COUPLING CO., LTD., TORONTO Associate Companies
Rockiron Company, Inc., Quarryville, Pa. • Precision Digon Steel Company, Camden, N.J.

. . . for more details circle 197, page 16

Here are important facts for the "man behind the gun"

This White 18" Dumpy level has

...more of the features you want, yet costs you less!

Before you buy, compare this White Dumpy level with a similar model of any other recognized make. From every standpoint — design detail . . . quality construction . . . work-speeding, life-lengthening features and cost — you'll quickly see why a White's the best buy you can make. It will make your work faster, easier, more accurate. Check this comparison chart:

FEATURES	D. White No. 7080	Instrument A	Instrument B
Magnifying power of telescope	35X	30X	27X
Distance away you can read 1/100 ft. graduation	1200 ft.	1050 ft.	900 ft.
Diameter of objective lens	1.81 in.	1.485 in.	1.69 in.
Field of view (in minutes of arc)	64'	52'	60'
Coated optics	YES	YES	YES
Covered leveling screws	YES	YES	YES
Can you easily replace worn leveling screws in the field?	YES	NO	YES
Sensitivity of level vial (in seconds of arc per 2mm of graduation)	20"	20"	25"
Price — complete with carrying case, tripod and accessories — F.O.B. factory	$315.00*	higher	higher

For complete details on the 18-in. Dumpy level and other equally fine engineering instruments, see your David White dealer, or write direct to David White Co., 325 W. Court Street, Milwaukee 12, Wisconsin.

DAVID WHITE COMPANY

We offer complete, expert repair service on all makes, all types of instruments.

*Price subject to change without notice.

. . . for more details circle 267, page 16

With the Manufacturers and Distributors

Rich Appointed Ad Mgr. Perfection Steel Body. R. N. Rich has been appointed advertising and sales promotion manager of Perfection Steel Body Co., Galion, O.

Stoody Changes Chicago Distributors. A change in Chicago distributors has been announced by Stoody Co., Whittier, Calif. A new organization. Hardfacing Sales & Engineering Co., 242 East 103rd St., Chicago, Ill., has been appointed exclusive distributor for the territory which includes roughly the northern third of Illinois, the southeastern section of Wisconsin and the northwestern portion of Indiana. This territory includes the trade areas of Chicago, Milwaukee, Dubuque, Davenport, Iowa and Gary, Indiana.

Keane, Explosives Expert Retires. LeRoy Keane, assistant general manager of the Explosives' Department, Hercules Powder Co., Wilmington, Del., has retired after 38 years service with the company.

New F.W.D. Dealer in Texas. L. W. Russell Motors, 9th and Highway, McAllen, Tex., has been appointed sales, parts, and service dealer for Four Wheel Drive Auto Co.'s heavy-duty four and six-wheel-drive trucks in southern Texas.

New Distributors for Jannite. Two new distributors for Jannite J-16 asphalt surface seal have been announced by Maintenance Inc., Wooster, O. Newly appointed to serve south central Virginia is Adams Construction Co., 2725 Roanoke Ave., S.W. Roanoke, Va. In northwestern Pennsylvania, sales will now be handled by Rohrer Construction Co., 1237 West 8th St., Erie, Pa.

H. W. Moore Opens New Office. H. W. Moore Equipment Co., Denver, Colo., has opened a branch office in Durango, Colo. It will be under the direction of Glenn Schroeder. Ralph Bickers, since 1953, South Central salesman, has been appointed assistant sales manager. He is succeeded by Gerald W. Moore in South Central District. Two new men recently employed by Moore Equipment are Bill Hardesty as a salesman for Eastern Colorado and Bob Riley as advertising manager.

New Distributors for General Road Machines. General Road Machines, Inc., Niles, O., has appointed the following new distributors to handle its entire line of road paving equipment: Hawkins Equipment Co., 1475 Thomas St., Memphis, Tenn. for western Tennessee, northern Mississippi and eastern Arkansas. Central and southern Georgia will be covered by Sim Grady Machinery Co., 1382 Guy Paine Road, Macon, Ga. Serving west central California will be Ferguson & Blakemore Machinery Co., 9025 "G"

Maxwell Joins Construction Machinery Co. James W. Maxwell has joined the Construction Machinery Co., Waterloo, Ia., as manager of its newly created research and development department.

Davis Heads Gar Wood Sales. David J. Davis, formerly sales manager of Gar Wood Tractor Equipment, has been appointed to the newly created position of general sales manager construction machinery, with headquarters in Findlay, O.

Electric Steel Foundry Promotes McQuaid. Joe E. McQuaid, for past 5 years assistant manager construction equipment division Electric Steel Foundry Co., Portland, Ore., has been appointed manager of the general sales department of the company.

New Pioneer Vice Presidents. W. A. Rundquist has been elected vice president, sales promotion, for Pioneer Engineering Works, Inc., Minneapolis, Minn., a subsidiary of Poor & Co., Chicago, Ill. Mr. Rundquist is also director of advertising and public relations for Poor & Co. He has been in charge of advertising and sales promotion activities for Pioneer since 1945. A. J. Belanger has been elected vice president, sales. Belanger joined Pioneer's Engineering Department in 1940. In 1951 he was appointed assistant sales manager and in November 1953 named sales manager.

Handiest Locations in PITTSBURGH

Hotel Pittsburgher
PITTSBURGH PA.
Diamond St. below Grant

Right in the heart of the Golden Triangle—Hotel Pittsburgher

400 outside rooms with bath. Large-screen television and radio at no extra charge in every room. Air conditioning. Finest dining room.
ATlantic 1-6970,

Hotel Pittsburgher MOTEL

Opposite Greater Pittsburgh Airport on Airport Parkway west. 56 air-conditioned rooms with large-screen television at no extra charge. Tile bath. Private phone. Restaurant facilities. Courtesy car to and from airport.
AMherst 4-5152

a Knott Hotel

JOSEPH F. DUDDY, GEN. MGR.

MM Names Market Research Manager. Stephen K. Plasman has been appointed Manager of Market research for Minneapolis-Moline Co., Minneapolis, Minn. In the new drive for diversifying the MM line of farm and industrial machines, Plasman will organize an all-out search for new markets to absorb the large manufacturing potential of this century-old company.

New Lima Distributor. Baldwin-Lima-Hamilton Corporation, Construction Equipment Division, Lima, O., has appointed Stith Equipment Co., 966 Marietta St., N.W., Atlanta 18, Ga., as distributor for Lima shovels, cranes, draglines and pull shovels for northern portion of Georgia.

White Motor Promotes Two. Ray A. Fryer, heretofore assistant sales promotion and advertising manager of The White Motor Co., Cleveland, O., has been named advertising manager and David W. Sheehan, heretofore assistant to the vice president—sales, has been named sales promotion manager.

Leschen Appoints Muse. Maurice M. Muse has been appointed district sales representative for Leschen Wire Rope Division, H. K. Porter Co., Inc., St. Louis, Mo. His territory includes the eastern two-thirds of Kentucky and Tennessee and the northern half of Alabama.

Seaman Buys Willimon Mobil-Loader. Seaman-Andwell Corporation, Milwaukee, Wis., has purchased the Willimon Mobil-Loader, heretofore manufactured by J. R. Prewitt & Sons, Pleasant Hill, Mo. The unit will be renamed "Pulvi-Loader" and manufactured at Seaman-Andwell's Milwaukee plant.

Changes Name. David White Co., Milwaukee, Wis., manufacturers of surveying instruments, has changed its name to David White Instrument Co.

Hazard Appointed N. Y. Sales Staff. Walter R. Hazard has been appointed to New York sales staff of Construction Equipment Division of Blaw-Knox Co., Mattoon, Ill.

Ervin Promoted by Hyster. Richard M. Ervin, heretofore district representative for Eastern Tractor Equipment division, has been promoted by Hyster Co., Portland, Ore., to manager of the Washington, D. C. office and district manager of Hysters' East Central industrial truck division. He succeeds Robert E. Lange who will become resident manager of the Hyster wholly-owned subsidiary plant to be opened in San Paulo, Brazil.

Hirshorn New Manager Reinforcing Bar Sales. Lynn B. Hirshorn has been appointed manager of reinforcing bars and construction specialities sales for Bethlehem Steel Co., Bethlehem, Pa. He succeeds the late S. B. Brown.

New Distributor for Cleveland Trencher. Southern Equipment and Tractor Co., 1101 Louisville Ave., Monroe, La., and 2020 North 3rd St., Baton Rouge, La., have been appointed distributors for Cleveland trenchers and backfillers for the entire state of Louisiana and the six extreme southern counties of Arkansas.

Craig Appointed Manager Esso Asphalt Sales. W. D. Craig has been appointed manager of asphalt sales division of Esso Standard Oil Co. He succeeds F. R. Field, who will serve as asphalt consultant preparatory to retirement. A. R. Curtis, who has been serving as administrative assistant in Esso Standard's asphalt sales, has been appointed assistant division manager. Mr. Craig brings to his new post a total of 31 years' experience in asphalt marketing. He joined Esso in 1927.

Shunk Acquires New Plant. Shunk Manufacturing Co., Bucyrus, O., has acquired a new plant at Tuckahoe, N. Y., and began operation Aug. 1, as Shunk Manufacturing Co., Inc., 173 Marbledale Road.

New Canadian Distributor for Koehring. Western Tractor and Equipment Co., Lt., 1540 - 10th Ave., Regina, Sask., and 625 - 1st Ave., North Saskatoon, Sask., has been appointed distributor by Koehring Co., Milwaukee, Wis., for the entire province of Saskatchewan. They succeed W. F. Fuller Machinery Co., Ltd., as exclusive Koehring representative in the area.

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